D4.3: Dissemination, Training and Exploitation Report v2

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Abstract	This deliverable defines and describes the dissemination, training and exploitation activities carried out by the SmartSDK partners between months 13 and 27, contrasting when appropriate with the original plan.
Keywords	Dissemination, trainings, exploitation, promotion, communication, events, strategy

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CO	Confidential to SmartSDK project and Commission Services		✓

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EXECUTIVE SUMMARY

The SmartSDK Work Package 4 (WP4) is dedicated to "Dissemination, Training and Exploitation" and aims at defining, maintaining and coordinating the appropriate mechanisms and tools to ensure broad visibility and impact of the project's work and results. The main objective is to promote the developed project's concepts and technologies for broad uptake both in the Mexican and European ICT landscape. This will also engage the overall adoption of FIWARE on a broad scale perspective, by contributing to create impact both at the European and international levels.

This document, taking on from the initial Dissemination, Training and Exploitation plan, provides the results achieved in the second year of the project.

During the second year, the project was quite active with:

➔ The support of the organization of three FIWARE Summits: two FIWARE Tech Summit and one FIWARE Global Summit

➔ The organization of 6 trainings in different cities

➔ The organization of a tutorial during MICAI 2017 event

➔ The organization of a workshop and hackathon in the 2nd International Conference on Smart Data and Smart Cities 2017

➔ The organization of 12 workshops in different cities

➔ The participation in the Smart City Expo Latam Congress 2018

➔ The participation in the COMIA 2018 event

➔ The participation in the Smart City Expo World Congress 2018

➔ The organization of 17 FIWARE Talks at different events;

➔ The release of 3 joint newsletters with FIWARE Mexico;

➔ The 14 publications to conferences and 1 tutorial.

➔ The contributions to ETSI CIM activities with API specifications.

➔ The contributions to GSMA activities with data models and the adoption of the NGSI-LD Standard.

Compared to the initial dissemination plan:

➔ The established goals of dissemination, training and exploitation, were achieved, with the exception of OASC involvement (due to political situation in Mexico).

➔ During the second the participation to relevant events increased compared to the first year.

➔ In the second year, the number of trained start-ups and researchers in Europe and México, is twice the number obtained in the first year.

➔ There are 170 followers, and more than 260 tweets in the SmartSDK Twitter, almost twice compared with the first year.

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ABBREVIATIONS

CIM	Context Information Management
CONACYT	Mexican National Council for Science and Technology
DG CONNECT	Directorate General for Communications Networks, Content & Technology
ICT	Information & Communication Technologies
ISG	Industry Specification Group
KPI	Key Performance Indicator
LD	Linked Data
NGSI	Next Generation Service Interface
OASC	Open & Agile Smart Cities
OPEX	Operating Expense

1   INTRODUCTION

FIWARE, a public-private partnership initiative supported by the European Commission, is nowadays considered the reference platform for Future Internet solutions. FIWARE, with the recent enlargement engagement of third party actors not part of the original initiative, rapidly evolved from being just a platform to become a complex and rich ecosystem. Today this ecosystem spans across Europe and beyond, thanks to the effort of the FIWARE Mundus initiative that led the establishment of FIWARE beyond European borders in countries such as Brazil, Chile and Mexico, and the collaboration around Smart Cities with major worldwide initiatives such as the Open & Agile Smart Cities (OASC) involving more than 100 cities all around the world.

Mexico is, so far, one of the countries that invested the most in FIWARE beyond European borders. Following the negotiations between the European Commission Directorate General for Communications Networks, Content & Technology (DG CONNECT) and the Mexican National Council for Science and Technology (CONACYT), Fondo de Información y Documentación para la Industria (INFOTEC) and Instituto Tecnológico de Estudios Superiores de Monterrey (ITESM) deployed a FIWARE Lab node in Mexico in the INFOTEC Data Centre in the state of Aguascalientes. The establishment of the FIWARE Lab node and the creation of the National Future Internet Laboratory (LaNIF) within INFOTEC have been the first steps in the engagement of Mexico within FIWARE. Following these actions, INFOTEC and ITESM engaged different Mexican actors with training activities on FIWARE technology. This initial phase of competence creation is instrumental for the engagement of industrial actors in Mexico. INFOTEC and ITESM, as research and technology transfer centres, have now the mandate from the Mexican National Council for Science and Technology (CONACYT) to transfer the acquired competences to Mexican cities and startups through their network of ICT incubators and accelerators (counting more than 30 incubators and more than 850 successful incubated ICT companies since 2001).

In this context, SmartSDK aims at fostering a long-term collaboration between Europe and Mexico by providing a shared FIWARE-based reference service architecture and data model to support the agile development of smart solutions.
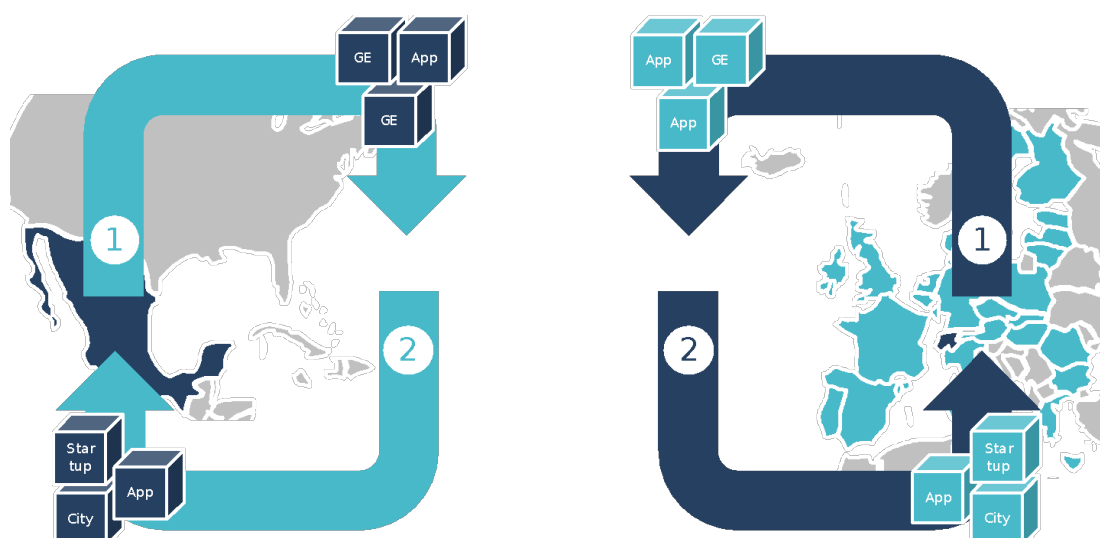
Figure 1. SmartSDK approach towards the creation of a sustainable FIWARE ecosystem between Europe and Mexico leveraging on existing FIWARE outcomes and building reference standards for common challenges.

To support SmartSDK's vision, Dissemination and Communication activities have a key role, especially during the second year, where first results become available and can be effectively adopted to support its goals toward the European and Mexican FIWARE communities.

As already presented in *D4.2: Dissemination, Training and Exploitation Report,* which contains the activities carried out in the first year covering M4 to M12 and the planned activities for this document, SmartSDK outreach activities are organized around three pillars:

➔ **Dissemination and communication activities** to promote SmartSDK results within the FIWARE Community and in the more general community of developers and providers of Smart Services;

➔ **Training activities** to support the development of a solid FIWARE ecosystem in Mexico and to translate the results validated in the Mexican FIWARE ecosystem to European FIWARE ecosystem; Best practices of FIWARE Lab training in the European Context will be used as a base to design a specific training for Mexico. Moreover, the new training programs will be enhanced with content from the technical contributions that SmartSDK will bring to the FIWARE ecosystem.

➔ **Exploitation and innovation activities** to ensure the impact of SmartSDK to the relevant standardization bodies and Open Source communities in alignment with the overall goals of the FIWARE Open Community, to support the injection of other actors in the FIWARE ecosystem (mainly cities and businesses) and to plan the commercialization of outcomes by industrial partners in Mexico and Europe.
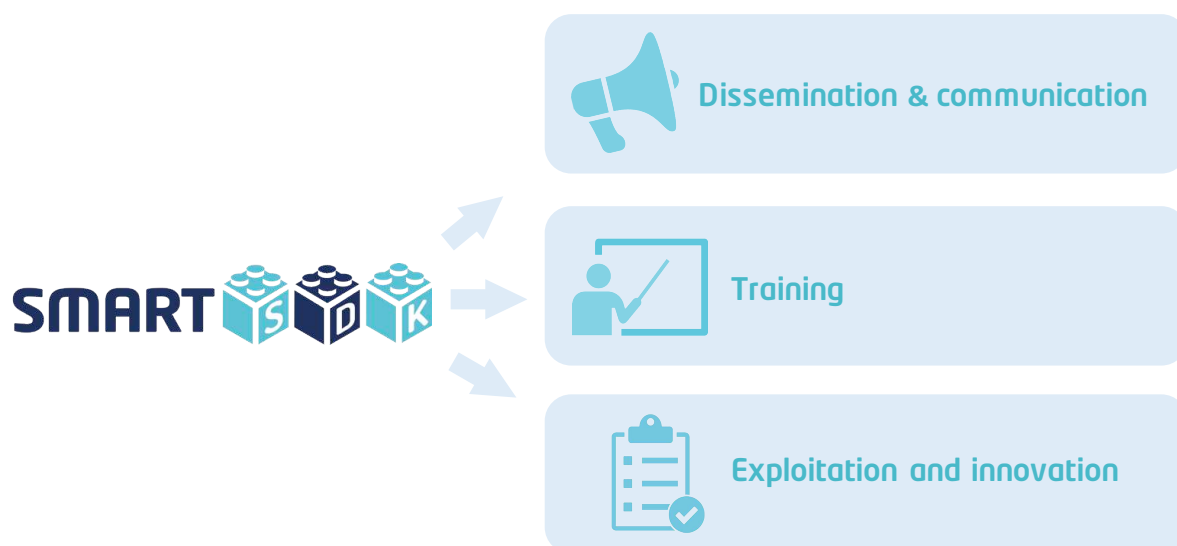
Figure 2. SmartSDK's pillars for impact maximization.

This deliverable reports the activities covered during the M13-M27 of the project. Planned activities, as in the previous reporting period, are organized in collaboration with the FIWARE Press Office and with the FIWARE MEXICO Coordination and Support Action. This allows maximizing the impact of the different initiatives run within the project and contribute to FIWARE international visibility in a harmonized way.

1.1 Objectives of the dissemination, training and exploitation activities

This deliverable supports SmartSDK towards the achievement of the following objectives:

➔ Define and implement a FIWARE training programme to support effective adoption and use of the FIWARE platform and its components;

➔ Support the access to FIWARE information related to Smart services development both in the European and Mexican market;

➔ Broadly disseminate the results of the project to the relevant stakeholders in the Smart City, Smart Healthcare and Smart Security industries;

➔ Ensure the alignment of communication activities with FIWARE Press Office;

➔ Support the growth of a vibrant FIWARE community in Mexico;

➔ Support the bi-lateral transfer of knowledge between European and Mexican FIWARE actors;

➔ Facilitate the contribution of FIWARE relevant results to Standardization and Open Source communities;

➔ Promote exploitation of the project's outcomes for both the project's partners and the target stakeholders in both Europe and Mexico.

1.2 Measuring the impact of SmartSDK

To measure the overall progress of SmartSDK towards its dissemination, training and exploitation goals, a number of KPIs have been defined during the project planning. The KPIs are reported in Table 1 with the status of achievement at M27.

Activity Type	Key Performance Indicator	Measure Year 1	Measure Year 2	Total	Achieved Year 1	Achieved Year 2	Total Achieved
Dissemination	Participation to relevant events	15	15	**30**	10	21	**31**
Dissemination	Presentation or demonstrations of SmartSDK	10	10	**20**	16	26	**42**
Dissemination	Number of yearly unique page views on SmartSDK web site	3000	5000	**8000**	6.745	5.835	**12.580**
Dissemination	Number of scientific publications	3	4	**7**	12	14	**26**
Dissemination	Number of organized events (including FIWARE Talks)	6	8	**14**	5	36	**41**
Training	Number of trained start-ups and researchers in Europe and Mexico	50	100	**150**	50	113	**163**
Training	Number of downloads of bi-lingual training material	100	150	**250**	80	100	**180**
Exploitation	Number of contributions to the international standardization activities	1	1	**2**	1	2	**3**
Exploitation	Number accepted contributions to Open Source communities	2	3	**5**	2	3	**5**
Exploitation	Number of new cities entering OASC	1	2	**3**	2	0	**2**

Table 1. SmartSDK KPIs for Impact Measures and their status at M27.

2 DISSEMINATION AND COMMUNICATION

SmartSDK's dissemination and communication activities aim at supporting the project development, raising awareness of the project outcomes and outreaching the relevant stakeholders. In particular, dissemination and communication activities include:

➜ Publication of scientific, industrial and general marketing material;

➜ Organization of promotional and engagement events in Europe and Mexico;

➜ Participation in worldwide events relevant for the presentation of SmartSDK results.

➜ Relevant outcomes to be disseminated, will include among the others:

➜ Success stories of new start-ups, cities and businesses born in Mexico leveraging on FIWARE;

➜ Novel solutions supported by demonstrators in the field of data-intensive and IoT-based applications;

➜ Data models developed to support the interoperability with NGSI of solutions in the Smart City, Smart Healthcare and Smart Security sector;

➜ Demonstrative applications in the Smart City, Smart Healthcare and Smart Security sector;

➜ Results of the trial conducted in the Smart City, Smart Healthcare and Smart Security sectors;

➜ Contributions to relevant standardization bodies, industry forums, and providing reference software implementations;

➜ Contributions to open source projects;

➜ Roadmap of the SmartSDK contributions to the FIWARE Open Community.

In the following sections, we present first a summary of the achievements from Month 13 (September 2017) to Month 27 (November 2018). Activities up to M12 have been already reported in detail in *D4.2: Dissemination, Training and Exploitation Report.*

2.1 Achievements from M13 to M27

In this section, we provide an overview of the different dissemination and communication activities covered by SmartSDK project between September 2017 and November 2018.

Activities cover:

➜ Organization and support of events;

➜ Presentation of SmartSDK and FIWARE at different events (FIWARE Talks)

➜ Release of dissemination material;

➜ Submission of scientific papers;

2.1.1 Organization and support of events

Between September 2017 and November 2018, SmartSDK organised and supported the organization several events, as reported in Table 2.

Event	Type	Date and location	Attendees
ANUIES TIC	Workshop	October 4, 2017, Estado de México, México	9
16th Mexican International Conference on Artificial Intelligence	Workshop	October 23-28, 2017, Baja California, México	15
2nd International Conference on Smart Data and Smart Cities	Paper presentation "Smart Cities Semantics and Data Models"	October 25, 2017, Puebla, México	70
2nd International Conference on Smart Data and Smart Cities	Workshop and Hackathon	October 25, 2017, Puebla, México	7
CONAINTE	Workshop	October 30, 2017, Hidalgo, México	21
XXIV Semana Nacional de Ciencia y Tecnología	Workshop	November 21-22, 2017, Oaxaca, México	24
FIWARE Tech Summit 2017	Conference	November 28, 29 2017, Málaga, Spain	200
48th Conference on research and development	Workshop	January 23-26, 2018, Nuevo León, México	100
Urban Intelligence	Conference	7th February 2018, Murcia, Spain	100
European Science Diplomacy Week	Conference	March 21, 22 2018, México City, México	150
Workshop entitled "Taller gerencial sobre FIWARE México: Conocer acerca de la plataforma FIWARE con enfoque de investigación y comercialización de productos"	Workshop	April 13, 2018, Morelos, México	40
FIWARE Global Summit 2018	Conference	May 8, 9 2018, Porto, Portugal	574
FIWARE Smart Services for Mexico and Starter Kit	Workshop	July 13, 2018, México City, México	50
University of Alicante Summer School	Workshop	July 18, 2018 Alicante, Spain	70
FIWARE Workshop: Orion Context Broker and QuantumLeap	Workshop	August 2-3, 2018, Yucatán, México	23
FIWARE EU-México - Enabling technologies for Smart Cities - within the SmartCity Expo Latam Congress	Workshop	September 11-13, 2018, Puebla, México	50
IEEE 5G Summit	Conference	October 19, 2018, Marrakech Morocco	200
Smart Applications with FIWARE within the 17th Mexican International Conference on Artificial Intelligence	Workshop	October 22-27, 2018, Jalisco, México	
3rd Workshop on Urban Intelligence (UrbInt 2018)	Workshop	November 15-16, 2018, Baja California, México	34

FIWARE Tech Summit 2018	Conference	November 26-28 2018, Málaga Spain	473

Table 2. SmartSDK KPIs for Impact Measures and their status at M27.

2.1.2 FIWARE Global Summit (Porto)

SmartSDK also supported the organisation of the FIWARE Summit in Porto supporting the definition of the Technical Agenda of the event. In Figure 3, the FIWARE CTO is presenting a talk.

Figure 3. FIWARE's CTO at the Summit in Porto.

During the event, the following activities were done (c.f. Table 3):

➜ INFOTEC attended the meeting of the FIWARE iHubs committee.

➜ INFOTEC participated in the evaluation of the proposals of the FIWARE iHub call

➜ INFOTEC presented a Talk about the progress of the training in FIWARE México

➜ INFOTEC participated in the Open Camp FIWARE event organized by FIWARE México project (see Figure 4).

Figure 4. Open Camp FIWARE at the Summit in Porto.

➔ FBK & MARTEL presented a talk: Quantumleap, a FIWARE time series DB by demoing the deployment of Quantumleap with the SmartSDK platform manager on the FIWARE Lab.

➔ MARTEL and UBIWHERE had a booth on "Orchestra Cities" a commercial platform based on outcomes of SmartSDK.

➔ ITESM presented a talk called "Recommendations to improve communication FIWARE México" at FIWARE Open Camp (see Figure 5), which was held in conjunction with FIWARE México, within the activities of the FIWARE Summit (Porto), in order to present the results of the group of discussion for communication.

Figure 5. ITESM giving a talk at the FIWARE Open Camp.

2.1.3 Smart City Expo LATAM CONGRESS 2018

During the event the following activities were carried out:

➜ INFOTEC presented a talk about smart cities (see Figure 6), and also it was in the FIWARE Booth bringing information about the FIWARE Platform and the applications developed in the SmartSDK Project. INFOTEC also attended the workshop "FIWARE Foundation: FIWARE EU-Mexico - Enabling technologies for Smart Cities.

Figure 6. INFOTEC giving a talk at the Smart City Expo LATAM.

➜ MARTEL presented two talks (Workshop and Agora stand-up, see Figure 7) and attended several visitors at the FIWARE booth, introducing the FIWARE principles and the work done with SmartSDK and FIWARE Mexico projects. Tomas from Martel was interviewed for a local dissemination channel by Katya Rogell from UDLAP to comment about FIWARE and SmartSDK in México.

Figure 7. MARTEL giving a talk at the Smart City Expo LATAM.

➔ ITESM attended to the FIWARE booth actively participating in the dissemination of the FIWARE-related initiatives through demos, brochures, and posters for all audiences (see Figure 8). ITESM was in charge of organizing the logistic activities related to the dissemination booth and of the workshop entitled "FIWARE Foundation: FIWARE EU-Mexico - Enabling technologies for Smart Cities". Moreover, Miguel González from ITESM was chair and speaker of the previously mentioned workshop as well as one of the speakers of the talk "Technological Disruption in Urban Operation", where he talked about FIWARE for Smart Cities.

Figure 8. ITESM attending the booth at the Smart City Expo LATAM.

Figure 9. Twitter card for the "FIWARE EU-Mexico - Enabling technologies for Smart Cities" workshop.

2.1.4 FIWARE Summit Malaga 2018

During the event, the following activities were carried out:

➔ HOPU has included a booth where the experiences with Smart Spot in SmartSDK (see Figure 10) were presented and key innovations developed during the project such as data models for different sensors of green routes and POIs (tourism).

Figure 10. HOPU´s CEO giving a talk at the FIWARE Summit in Málaga.

➔ MARTEL's CTO presented QuantumLeap (see Figure 11), a component developed in SmartSDK project, in a talk titled "QuantumLeap: Managing the Stream of Context Information History using Time Series DBs". It presented the latest features and contributions made by the project in the official FIWARE tutorials.

Figure 11. MARTEL´s CTO presenting QuantumLeap at the FIWARE Summit in Málaga.

➔ One the most important activities was the evaluation of the LaNIF-iHub located in INFOTEC, which was ascended from basic center to a one star (see Figure 12). Based on the evidence presented about the capacity of the iHub to provide training in multiple entities in Mexico, a

positive evaluation was obtained to the request.
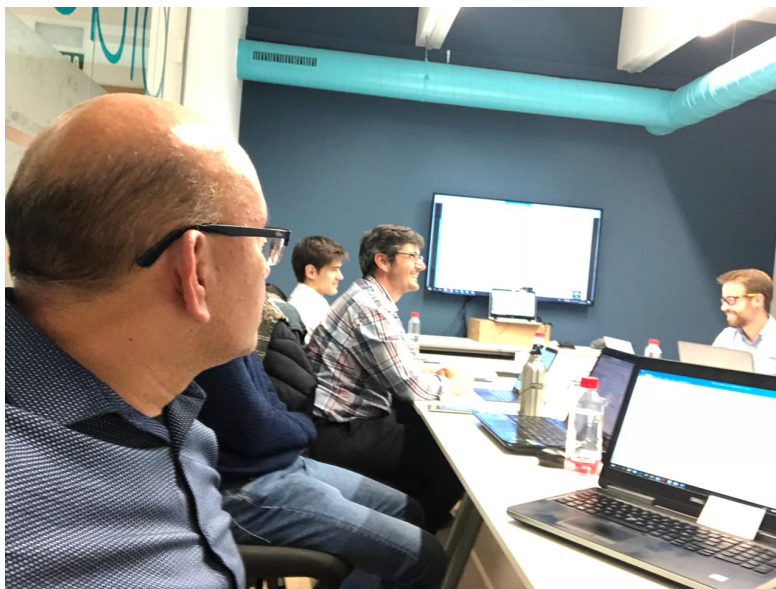
Figure 12. INFOTEC attending the evaluation of the LaNIF as an iHub at the FIWARE Summit in Málaga.

➡ INFOTEC participate in a plenary meeting with the administrators of the FIWARE nodes in the world. In this meeting, a roadmap of the key activities that the nodes will carry out during the first 6 months of the next year was made.

➡ INFOTEC participate in a meeting with FIWARE Foundation, HOPU and the people in charge of the FIWARE Zone in Málaga. In this meeting, the short term-activities of LaNIF were defined.

➡ ITESM and INFOTEC presented SmartSDK activities at the Synchronicity's workshop (see Figure 13), to enhance collaboration with other cities, particularly related to security and privacy for public services, in the way of Common European Facilities.

Figure 13. ITESM and INFOTEC attending the Synchronicity's workshop at the FIWARE Summit in Málaga.

2.1.5 Smart City Expo Barcelona 2018

During the event the following activities were carried out:

➡ HOPU has included a booth where Smart Spot is presented and key innovations developed during the project.

➡ MARTEL was honoured to be called on stage to receive the 2nd place prize in the 5G Smart

City Vertical Use Case Awards[1] for the Green Route Application lead by INFOTEC (see Figure 14). The award recognises the potential of 5G technologies in Smart City solutions and "aims to ignite the generation of Smart City Use Case Ideas that could be manifested given the 5G technologies". At the FIWARE booth, MARTEL had the possibility to present the three main applications developed in SmartSDK, as well as Orchestra Cities, a Smart Cities platform developed leveraging on FIWARE and the main results of the SmartSDK project.

Figure 14. Martel receiving the 2nd Prize for GreenRoute at SCWE Barcelona 2018

➔ Ubiwhere has participated with a 60 square meter booth where it was possible to discuss, present and demo the results of SmartSDK and Green Route use case. The company's CEO gave a talk about data-driven smart cities where the SmartSDK use case was presented (see Figure 15).

Figure 15. Ubiwhere's CEO giving a talk and Ubiwhere's booth at the Smart City Expo Barcelona.

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[1] https://5g-ppp.eu/5g-smart-city-vertical-use-case-awards-winners/

2.2 Presentation to events and FIWARE Talks

During the reporting period, SmartSDK project organised different presentations and FIWARE Talks as documented in Table 3.

#	Title	Location	Date	Partner
1	FIWARE talk to students of the Autonomous University of the State of Hidalgo	México City, México	September 28, 2017	INFOTEC
2	FIWARE talk about SEKC (Software Engineering Knowledge Composer) developed by INFOTEC	México City, México	October 04, 2017	INFOTEC
3	FIWARE talk in the annual meeting of National Laboratories Conacyt	México City, México	October 06, 2017	INFOTEC
4	FIWARE talk to students of the Universidad de la Cascada	México City, México	November 16, 2017	INFOTEC
5	Booth at Hannover Messe	Hannover, Germany	April 23-28, 2018	INFOTEC, ITESM
6	FIWARE talk to the students of the Universidad Autónoma del Estado de Morelos (UAEM), with the topic "Smart cities: applications for decision making"	Cuernavaca, Morelos	May 4, 2018	CENIDET
7	FIWARE talk called: "Recommendations to improve communication FIWARE México" at FIWARE Open Camp in the FIWARE Global Summit	Porto, Portugal	May 8-9, 2018	ITESM
8	FIWARE talk about QuantumLeap at FIWARE Global Summit	Porto, Portugal	May 8-9, 2018	FBK, MARTEL
9	Booth on "Orchestra Cities" at FIWARE Global Summit	Porto, Portugal	May 8-9, 2018	MARTEL, Ubiwhere
10	Participation in the evaluation of the proposals of the FIWARE iHub call at FIWARE Global Summit	Porto, Portugal	May 8-9, 2018	INFOTEC
11	Talk about the progress of the training in FIWARE México at FIWARE Global Summit	Porto, Portugal	May 8-9, 2018	INFOTEC
12	FIWARE at 10th Congress on Artificial Intelligence (COMIA)	Yucatán, México	June 5-8, 2018	INFOTEC, ITESM
13	FIWARE talk at Global Conference on Applied Physics, Mathematics & Computing	Madrid, Spain	July 25-27, 2018	INFOTEC
14	FIWARE talk in the Smart City Expo LATAM Congress	Puebla, México	September 11-13, 2018	INFOTEC, ITESM, MARTEL
15	Booth about FIWARE Platform and the applications developed in the SmartSDK Project at Smart City Expo LATAM Congress	Puebla, México	September, 11-13, 2018	INFOTEC, ITESM, MARTEL
16	FIWARE talk to students in the ITSMT Congress	Martínez de la Torre, Veracruz	October 22-27, 2018	INFOTEC
17	Poster session about FIWARE as the base platform for development	Baja California, México	November, 15-16, 2018	CICESE
18	Green Route talk at Smart City Expo World Congress	Barcelona, Spain	November 13-15, 2018	MARTEL
19	Data-Driven Cities at Smart City Expo World Congress	Barcelona, Spain	November 13-15, 2018	Ubiwhere
20	Booth about Smart Spot and key	Barcelona, Spain	November 13-	HOPU

	innovations developed during the project at Smart City Expo World Congress		15, 2018	
21	Talk about a QuantumLeap at the FIWARE Global Summit	Málaga, Spain	November 26-28, 2018	MARTEL
22	FIWARE talk at XXIV Semana Nacional de Ciencia y Tecnología	Oaxaca, México	November 21-22, 2018	ITESM
23	Talk about the Smart Spot and POIs in SmartSDK at the FIWARE Global Summit	Málaga, Spain	November 26-28, 2018	HOPU
24	Talk about SmartSDK activities at the Synchronicity's workshop	Málaga, Spain	November 26-28, 2018	ITESM, INFOTEC
25	Evaluation of the LaNIF-iHub located in INFOTEC at FIWARE Global Summit	Málaga, Spain	November 26-28, 2018	INFOTEC
26	Collaboration in the definition of a roadmap of the key activities that FIWARE Lab nodes will carry out in the next months at FIWARE Global Summit	Málaga, Spain	November 26-28, 2018	INFOTEC

Table 3. Presentations provided by SmartSDK project on the project itself or FIWARE.

2.3 Release of dissemination material

In period from September 2017 to November 2018, SmartSDK released the material documented in Table 4.

#	Title	Description
1	Web site	From 1st September 2017 to 30th November 2018, the web site received 3.342 different users and 5.691 unique page views (12.850 in total). We published 15 news.
2	Newsletter	3 Newsletters in collaboration with FIWARE Mexico project. The newsletter counts now more than 124 subscribers. One more newsletter is planned before the end of december.
4	Presentation	4 releases of bi-lingual SmartSDK presentation sets.
5	Twitter	170 followers and more than 260 tweets, and 500 impressions per day in average.
6	Mexican magazine	An article has been published in the "u-gob government technology" mexican magazine about Green Route https://u-gob.com/green-route-la-aplicacion-para-una-movilidad-inteligente/
7	Conacyt prensa	An online new has been published about the SmartSDK project work meeting carried out from october 9 to 12 in the National Institute of Astrophysics, Optics and Electronics (INAOE) in Puebla, México. http://www.conacytprensa.mx/index.php/centros-conacyt/boletinescentros/18632-se-lleva-a-cabo-reunion-de-trabajo-del-proyecto-smart-sdk
8	New in a mexican newspaper	A new has been published in the online newspaper "La Jornada": An open source IoT platform has been created in México. The new is about Cloudino and FIWARE. https://www.jornada.com.mx/ultimas/2018/05/04/crean-plataforma-gratuita-para-internet-de-las-cosas-en-mexico-9433.html
9	Videos in social media	Different videos have been generated to disseminate

information about the National Future Internet Laboratory (which hosts the Mexican FIWARE Lab node), FIWARE Technologies and applications developed in México. These videos have been published in YouTube, Facebook and Twitter accounts of INFOTEC.
LaNIF and FIWARE Technology:
https://www.youtube.com/watch?v=mfH0PewDFhw&t=90s
Data visualization with FIWARE:
https://www.youtube.com/watch?v=BTggv8PLxcc&t=1066s
Software Engineering Knowledge Composer:
https://www.youtube.com/watch?v=_iOZPxquB9c

Table 4. Released dissemination material.

2.4 Submission of scientific papers

In the period from September 2017 to November 2018, SmartSDK partners published the following publications related to the project achievements:

➔ Alicia Martínez, Fernando Ramírez, Hugo Estrada, L.A Torres. "Generic Module for Collecting Data in Smart Cities". International Archives of the Photogrammetry, Remote Sensing, and Spatial Information Sciences. vol. XLII-4/W3, 2nd International Conference on Smart Data and Smart Cities, October 4-6, 2017, Puebla, México.

➔ Pedro Wences, Alicia Martinez, Hugo Estrada, Miguel González. Chapter 9: "Decision-Making Intelligent System for Passenger of Urban Transports". Book: Ubiquitous Computing and Ambient Intelligence (UCAmI). Publisher: Lecture Notes in Computer Science LNCS 10586. pp. 128–139. ISBN 978-3-319-67584-8. DOI 10.1007/978-3-319-67585-5, 11th International Conference on Ubiquitous Computing and Ambient Intelligence (UCAmI), November 7-10, 2017, Philadelphia, PA, USA.

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➔ Alicia Martinez, Hugo Estrada, Fernando Ramirez and Miguel Gonzalez. "A new software library for mobile sensing using FIWARE technologies", 17th Mexican International Conference on Artificial Intelligence (MICAI), October 22-27, 2018, Guadalajara, México. Accepted in Conference.

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2.5   FIWARE in Mexico Workshops

One of the main goals was to organize and launch a series of events targeting communities of developers in key regions throughout Mexico. Such communities targeted both Industries and Universities to create a synergy between two of the main actors that play an important role in new trends in IT development and adoption. The Workshops were tailored depending on Universities and Industries requirements. That is, activities during the workshop centered their attention on each University and/or Industry specialization. In the same way, these Workshops focused on disseminating FIWARE, the initiatives related to this platform, and the based-FIWARE technological solutions proposed in SmartSDK. Thereby, the Workshops were divided into three main phases: a Demo or presentation to show the attendees a current ongoing solution created by any of the consortium partners, a training session to demonstrate how a new solution can be developed, and finally, a hackathon that brought participants together to find new innovative solutions.

Therefore, to both disseminate and exploit SmartSDK were carried out a series of Workshops following three main sections. The first section focused on a FIWARE introduction, second and third sections were hand to hand, whilst the second section shared all available Demos generated within the project's scope the third section provided SmartSDK recipes, as well as guides related to the keystone of FIWARE: Orion Context Broker, to accelerate a hackathon event. Such Workshops focused on developers from Academia and local Industries, while these stakeholders played a key role in the innovation scene, the circle is not closed without key decision and policy makers are not part of this dynamic. FIWARE Mexico synergy was the key element to bring in such stakeholders.

As early mentioned, the Workshops were held on key regions of technological development in Mexico as follows.

- **Toluca de Lerdo, Estado de México**

  On October 4 of 2017, a Workshop entitled "*Taller de Introducción a FIWARE para CIO de Universidades y Centros de Investigación*" was held within the activities of the ANUIES TIC event. The Workshop aimed an introduction and explanation about FIWARE ecosystem in Europe as well as success stories achieved there. Furthermore, approaches to use FIWARE in Smart Cities development and how to accomplish this in México with a special interest in smart illumination were the topics extensively argue in the event. Philips, CIAO, and UAEMex were

the Enterprises and Universities that attended the event.

➔ **Ensenada, Baja California**

The Workshop "FIWARE Tutorial at MICAI" was held within the activities of the event "16th Mexican International Conference on Artificial Intelligence" on October 23 to 28 of 2017. An introduction to FIWARE platform, use cases and success stories based on FIWARE solutions, current projects developed in México, and an introduction to the Orion Context Broker Generic Enabler were the topics addressed in the Workshop. Universidad Autónoma de Baja California (UABC) Campus Ensenada attended this event.

➔ **Monterrey, Nuevo León**

The "48º CONGRESO DE INVESTIGACIÓN Y DESARROLLO" event was held in the Tecnológico de Monterrey on January 23 to 26 of 2018. Within the event, a Workshop aimed the dissemination and use of FIWARE platform for research and development of industrial applications was celebrated. The Workshop concentrated an introduction to FIWARE platform, use cases and success stories based on FIWARE solutions, current projects developed in México, and an introduction to the Orion Context Broker and Kurento Generic Enablers.

➔ **Cuernavaca, Morelos**

The Workshop entitled "*Taller Gerencial sobre FIWARE México: Conocer acerca de la plataforma FIWARE con enfoque de investigación y de comercialización de productos*" was celebrated on April 13 of 2018. The Workshop aimed the dissemination of the FIWARE platform to representatives of the energy sector. The topics addressed in this Workshop were the use of the FIWARE platform and cloud capabilities, the benefits that bring the "Laboratorio Nacional de Internet del Futuro", and an introduction to the FIWARE's accelerator programme as well as the "Open Agile Smart City" initiative.

➔ **Mérida, Yucatán**

At Universidad Politécnica de Yucatán (UPY) was imparted the Workshop entitled "FIWARE Workshop: Orion Context Broker and QuantumLeap training" on August 2 and 3 of 2018. The following aspects were imparted in the Workshop: an introduction to IoT and the FIWARE platform, use cases and success stories based on FIWARE solutions, current projects developed in México, an introduction to the Orion Context Broker Generic Enabler, and a hands-on with Orion Context Broker, CrateDB, Grafana, and QuantumLeap. The assistants of the Workshop were from UPY and from the company Plenumsoft Consultoría y Servicios.

➔ **Puebla de Zaragoza, Puebla**

Within the event "SmartCity Expo Latam Congress" held on September 11 to 13 of 2018, the Workshop "FIWARE Foundation: FIWARE EU-Mexico - Enabling technologies for Smart Cities" was imparted. The Workshop aimed to present the results of the FIWARE projects carried out jointly by the EU and México and discuss the next steps needed to increase the adoption of the FIWARE technologies in México. People from many enterprises, companies, universities, and governmental sector were present at this Workshop.

➔ **Zapopan, Jalisco**

At the 17th Mexican International Conference on Artificial Intelligence event was held the Workshop entitled "Smart Applications with FIWARE" on October 22 to 27 of 2018. The Workshop comprised an introduction about the FIWARE platform, use cases in Europe and México, current solutions in development in México, an introduction to the Orion Context Broker Generic Enabler, and FIWARE services centered in Docker technologies.

The original plan also considered the City of Querétaro; however, the workshop had to be indefinitely postponed. Notwithstanding, two additional workshops were imparted in the following cities:

➜ **Mixquiahuala, Hidalgo**

On October 30 of 2017, it was imparted the Workshop entitled "FIWARE Workshop" as part of the "3er. Congreso Nacional de Ingeniería y Tecnologías para el Desarrollo Sustentable" (CONAINTE) celebrated at "Instituto Tecnológico Superior del Occidente del Estado de Hidalgo" (ITSOEH). The Workshop concentrated an introduction to the FIWARE platform, use cases and success stories based on FIWARE solutions, current projects developed in México, a description of FIWARE Lab, and an introduction to the Orion Context Broker Generic Enabler. The Workshop was imparted to students and professors from this University.

➜ **Oaxaca de Juárez, Oaxaca**

At the event "XXIV Semana Nacional de Ciencia y Tecnología", held in Instituto Tecnológico del Valle de Oaxaca on November 21 and 22 of 2017, was imparted the Workshop "Introducción a la Plataforma Tecnológica FIWARE". The following aspects were imparted in the Workshop: an introduction to IoT and the FIWARE platform, use cases and success stories based on FIWARE solutions, current projects developed in México, a description of FIWARE Lab, and an introduction to the Orion Context Broker Generic Enabler. The Workshop was imparted to students from this University.

Furthermore, the participants were involved in hands-on activities to identify an area of opportunity for their community in different sectors and developed a draft of how to cover this opportunity by using the FIWARE's technology.

Figure 16. SmartSDK website banner to announce and promote the mexican workshops held in Hidalgo.

3   TRAINING

Training has a crucial role in SmartSDK for supporting the growth of a FIWARE ecosystem in Mexico and to create the conditions that enable the Mexican institutions to contribute in the evolution of FIWARE pillars.

These activities will focus on three key aspects:

→ Raise awareness and motivate Mexican entrepreneurs, start-ups, SMEs and general makers and developers to be part of the FIWARE community. This motivation should rise from the discovery of the opportunity to develop smart services in a fast, scalable and cost-affordable way.

→ Teach via success stories about the opportunities that FIWARE enables and how it can be carried out in Mexico, explaining and providing the material such as hands on tutorials for the different Enablers and reference applications, FIWARE-ready devices kits (Internet of Things), and finally interactive webinars and physical workshops.

→ Provide support to the Mexican innovation community to be an active member of FIWARE via enabling new hardware and devices into the FIWARE-ready program, evolve and contribute to the specific Open Source community and even propose new Enablers to the incubation program from FIWARE.

3.1   Report on Training Activities (M13-M27)

In the period from September 2017 to November 2018, the following trainings were organised:

Title	Date	Location	Attendees
FIWARE Tutorial at MICAI	October 23-28, 2017	Baja California, Mexico	15
FIWARE training carried out in CONAINTE (3er Congreso Nacional de Ingeniería y Tecnologías para el Desarrollo Sustentable)	October 25-27, 2017	ITSOEH, Hidalgo, México	21
FIWARE training with Cloudino	January 22-25, 2018	INFOTEC, México City	15
FIWARE training: Orion Context Broker and Quantum Leap training	August 2 and 3, 2018	Yucatán, México Universidad Politécnica de Yucatán	20
2nd International Conference on Smart Data and Smart Cities (UDMS 2017)	October 4-6, 2017	Puebla, México	11
XXIV Semana Nacional de Ciencia y Tecnología	November 21-22, 2017	Oaxaca, México	24
Environmental monitoring using FIWARE: a Case of the Internet of Things	September 14, 2018	ITESM Campus Estado de México, México	7

Table 5. Training events by SmartSDK.

3.2   Training Courses

Training courses of SmartSDK have the general objective of supporting the growth of the FIWARE ecosystem in Mexico by promoting the use and reuse of the components developed in project execution for the creation of smart application for security, health and smart cities. The use of these novel

components will represent a big advantage for Mexican institutions in the creation of smart services that help to improve the life quality of citizens.

The SmartSDK training enables the attendees to:

➔ *Develop Smart Applications with FIWARE.* The training will provide the tools to build smart services build up on the Smart Healthcare, Smart City and Smart Security applications deployed by the project. The developers will have an overview of both main Generic Enablers for IoT Management and Data/Context Management Chapters and NGSI-based data models. The training will enable the developers to include additional devices or data-sources in the applications by following the principles of the FIWARE reference architecture for data-intensive and IoT based applications

➔ *Contribute to the FIWARE Open Community 101*. The training will provide the overview of the best practices of the FIWARE Open Community and of the tools adopted to develop, test and document FIWARE GEs. The training will also cover the submission and review process that new Enablers are subject to and how to submit blueprints for existing Enablers.

It is worth noting that the contents of the Training Courses Materials were not exactly developed in the originally intended structure presented in the previous version of this deliverable. In some cases, some modules remained as planned, but in others contents were covered by other guides, such as the SmartSDK tour-guide, or even the newest version of the FIWARE Official "Step-by-step" guides. The following section preserves the originally structure of content, but gives pointers to where the essential information for each covered topic can be found.

Finally, the approach of organising and publishing the materials as open source repositories in github enabled the contribution of the community in both ways. SmartSDK was able to contribute to official FIWARE materials, but also the FIWARE community contributed back to the SmartSDK materials. An example of this is the translation to Japanese we received for QuantumLeap (https://github.com/smartsdk/ngsi-timeseries-api/pull/75) the SmartSDK Recipes (https://github.com/smartsdk/smartsdk-recipes/pull/44) and the Guided Tour (https://github.com/smartsdk/guided-tour/pull/13).

3.2.1 Module 1 "FIWARE and Smart Services: An Overview"

Duration: 30 minutes

Description: This module illustrates the benefit of adopting FIWARE in the development of Smart Services.

Audience: This course is oriented to developers and Operators interested into deploying FIWARE Smart mobility applications in a specific city. Besides, this could be attended by developers interested into adopting FIWARE or contributing to the initiative.

3.2.1.1 Agenda

1. Introduction to FIWARE
    a. Ecosystem
    b. Platform
    c. FIWARE Cloud
2. Why is it FIWARE perfect to build smart services?
    a. FIWARE Architecture (for Smart services) Overview
    b. Data Models Overview
3. Example of FIWARE Smart City applications
    a. Green Route: A smart mobility application
    b. Related to start-ups: Glue & Blue (GnB) proposes a mobile-oriented marketplace to bring the opportunities of the 3D printing and the IoT to the consumers market.
4. Example of FIWARE Smart Security applications

  a. A video surveillance application
  b. Related to start-ups: FLOUD is based on sensors equipped with advanced video analysis software, FLOUD is the answer to smart cities' need for minimally invasive systems to improve transport management.

5. Example of FIWARE Smart Health
  a. Ma-test: An application to expedite the harmonization and sharing of mobile sensing datasets for the healthcare domain.
  b. Related start-ups: UMANICK Identity for Health is a complete suite of multi-biometric and multi-modal software that uses the most advanced biometric technologies: fingerprint, iris, face, and voice recognition.

6. SmartSDK overview

3.2.1.2 Material

➔ The material to cover items 1 and 2 have been published in the following link:

  o https://fiware-training.readthedocs.io/es_MX/latest/introduction/

➔ The material to cover item 3 has been published in the following link:

  o https://green-route-manual.readthedocs.io/en/latest/

➔ The material to cover item 4 has been published in the following links:

  o Documentation in English: http://video-surveillance-application.readthedocs.io/en/latest/

  Documentation in Spanish: http://video-surveillance-application-es.readthedocs.io/es/latest/

➔ Provide support to the Mexican innovation community to be an active member of FIWARE via enabling new hardware and devices into the FIWARE-ready program, evolve and contribute to the specific Open Source community and even propose new Enablers to the incubation program from FIWARE.

➔ The material to cover item 5 has been published as listed below:

  o English documentation: https://ma-test-fiware.readthedocs.io/en/latest/

  o Spanish documentation: https://ma-test-fiware.readthedocs.io/es/latest/

  o Installation process using Docker containers: https://github.com/netzahdzc/mat-dashboard

➔ The material to cover item 6 has been published in the following link:

  o https://guided-tour-smartsdk.readthedocs.io/en/latest/introduction/

3.2.2 Module 2 "Basics: FIWARE Lab"

Duration: 45 minutes

Description: This module will illustrate how to create an account on FIWARE Lab and how to use in combination with Docker to develop you FIWARE-based applications.

Audience: This course is oriented to programmers and developers with the following previous knowledge: linux systems, cloud containers, virtualization, ROA, REST, SSH, network connectivity, microservices, Hadoop and OpenStack.

3.2.2.1 Agenda

1. Learning the basis of FIWARE LabCloud capabilities

a. Identity services
    i. Create account, understanding account categories, signing in cloud portal.
b. Compute services
    i. Create a keypair, create a group security, deploy an instance, associate public IP with V, how to connect to instance from Windows/Linux.
c. Storage services
    i. create volumes, attached volume to servers, configure the instance to detect the new volume
d. Data portal
    i. What is it, what it offers
2. Create your docker Swarm Cluster in FIWARE Lab
    a. Register in FIWARE Lab
    b. Configure your cluster
    c. Setup Swarm on FIWARE Lab
3. Deploy your cluster
4. Preparing Portainer
    a. Export configuration for Docker CLI
5. Create your Docker Swarm cluster on your Laptop
    a. Prerequisites
    b. Cluster creation
    c. Test your cluster
6. Deploy your platform using SmartSDK recipes
    a. Prerequisites
        i. Checking access to your cluster
        ii. Checking the networks
        iii. Getting the recipes (optional)
    b. Deploying a highly available MongoDB replica set
        i. From the command line
        ii. Using Portainer
    c. Deploying a highly available Context Broker
        i. From the command line
        ii. Using Portainer
    d. Deploy a highly available QuantumLeap
        i. Prerequisites
        ii. From the command line
        iii. Using Portainer
    e. Deploy a highly available IoT Agent
        i. From the command line
        ii. Using Portainer

3.2.2.2 Material

➔ The material corresponding to numbers 1, 2, 3, 4 and 5 have been published in the following link:

   o https://guided-tour-smartsdk.readthedocs.io/en/latest/platform/swarmcluster/

➔ The material corresponding to number 6 has been published in the following link:

   o https://guided-tour-smartsdk.readthedocs.io/en/latest/platform/deployservices/

3.2.3 Module 3 "Developing your first Smart City application" - Part 1: Connecting devices to FIWARE

Duration: 60 minutes

Description: This module, starting from a usage scenario will illustrate how to create a Simple Smart

City FIWARE-based applications. Part 1 focuses on how to connect devices to FIWARE and pushing data in the Context Broker.

Audience: This course is oriented to programmers and developers with the following previous knowledge: linux systems, cloud containers, virtualization, ROA, REST and SSH.

3.2.3.1 Agenda

1. Creating your Air Quality Sensor with Cloudino
   a. Introduction
   b. What you need to order
   c. How to add air quality sensors
   d. How to install and configure it
      i. Create an application development environment at cloudino.io portal
      ii. Connect a Cloudino WiFi connector to cloudino.io portal
      iii. Verify connection between Cloudino WiFi connector and cloudino.io
      iv. Define your application's logic through the development tools from cloudino.io
   e. Your Cloudino as IoT Agent
2. Query air quality data in the Context Broker
   a. Prerequisites
   b. Postman collection
   c. Query entities
3. Store historical data, query them and use them to create dashboards
   a. Prerequisites
   b. Store air quality data from Context Broker in QuantumLeap
   c. Query air quality data using QuantumLeap
   d. Creating nice dashboards using QuantumLeap and Grafana
4. Installing the FIWARE Smart Stack
   a. Setting up a Docker Swarm Cluster on your PC
   b. Installing the Context Broker with Docker
   c. Installing the IoT Agent with Docker
   d. Configuring and registering the IoT Agent in the Context Broker
5. NGSIv2 library: A JavaScript SDK using Node.js
   a. Introduction
   b. How it works the NGSI library
   c. NGSI-parser module
      i. JSON parser
      ii. Queries parser
      iii. Data Models Schemas Analyzer
   d. OCB-sender module
      i. General Functions
      ii. Multi-tenancy support
      iii. Entities Functions Block
      iv. Query Functions Block
      v. Subscription Functions Block
      vi. Implementation of OCB-sender module in Mobile Apps
   e. Basic Examples using both modules of the library
   f. Pre-requirements for NGSI library installation
   g. NGSI JavaScript library installation
      i. NGSI-parser module installation
      ii. OCB-sender module installation

3.2.3.2 Material

➔ The material corresponding to number 1 has been published in English in the following link:

     ○ In English in the following link: https://guided-tour-smartsdk.readthedocs.io/en/latest/sensors/cloudino/

     ○ In Spanish in the following link: https://fiware-training.readthedocs.io/es_MX/latest/sensores/cloudino/

➔ The material corresponding to number 2 has been published in the following link:

     ○ https://guided-tour-smartsdk.readthedocs.io/en/latest/services/contextbroker/

➔ The material corresponding to number 3 has been published in the following link:

     ○ https://guided-tour-smartsdk.readthedocs.io/en/latest/services/quantumleap/

➔ The material corresponding to module 5 has been published in the following link:

     ○ https://ngsi-js-library.readthedocs.io/en/latest/

3.2.4 Module 4 "Developing your first Smart City application" - Part 2: Querying, analysing and visualizing your data in FIWARE

Duration: 60 minutes

Description: This module, starting from a usage scenario will illustrate how to create a Simple Smart City FIWARE-based applications. Part 2 focuses on how to subscribe the context broker to other FIWARE enablers to perform advanced queries and visualizing data.

Audience: This course is oriented to programmers and developers with the following previous knowledge: linux systems, cloud containers, virtualization, ROA, REST and SSH.

3.2.4.1 Agenda

1. Enabling Short Term Historic persistence with Cygnus and Comet
    a. Installing Comet with Docker
    b. Installing and Configuring Cygnus with Docker
    c. Subscribing Cygnus to Context Broker data
    d. Querying Comet Timeseries
    e. Visualizing Comet Timeseries
    f. The future of Comet: QuantumLeap
2. Enabling Long Term Historic persistence with Cosmos GE
    a. Using Carto to visualise context data
    b. Create an account on carto
    c. Installing and Configuring Cygnus with Docker
    d. Subscribing Cygnus to Context Broker data
    e. Create your map on Carto
    f. Development routes based on GTFS
    g. Deployment a route engine

3.2.4.2 Material

➔ For Historic persistence, SmartSDK focused on the QuantumLeap component, developed within SmartSDK project. Even though we published recipes for both older components STH and Cygnus at https://smartsdk-recipes.readthedocs.io/en/latest/data-management/cygnus/readme/ and https://smartsdk-recipes.readthedocs.io/en/latest/data-management/sth/readme/ respectively.

➔ Materials covering the introduction to QuantumLeap can be found at https://guided-tour-smartsdk.readthedocs.io/en/latest/services/quantumleap/, http://quantumleap.readthedocs.io and also at https://fiware-tutorials.readthedocs.io/en/latest/, where we have contributed back to the official FIWARE tutorials.

3.2.5 Module 5 "Developing your first Smart Security application"

Duration: 90 minutes

Description: This module, starting from a usage scenario will illustrate how to create a Simple Smart Security FIWARE-based applications.

Audience: This course is oriented to programmers and developers with the following previous knowledge: linux systems, cloud containers, virtualization, ROA, REST and SSH.

The Smart Security Application is an automatic video surveillance system that aims to assist to the security team of an institution or company. The Smart Security Application is based on both video cameras and smartphones sensors. The system is integrated by two main modules: ViVA and Driving app.

3.2.5.1   Agenda

1. Overview of Smart Security scenario.
2. ViVA.
   a. Ingredients
      i. Sensors used - Cameras
      ii. FIWARE Enablers used. The complete system uses the Kurento, Keyrock, Quantumleap and Orion Context Broker enablers. For this tutorial is used the Kurento enabler only.
      iii. FIWARE Data models used.
   b. Requirements and installation
   c. Setting ip cams or videos
   d. Basic algorithms to detect movement (for saving videos) and people.
   e. Searching stored videos.
3. DrivingApp
   a. Introduction
   b. DrivingApp requirements
   c. Initial steps
      i. Installation and execution of the mobile app
      ii. User account registration and login
      iii. Enabling GPS of the mobile device
   d. DrivingApp Functionalities
      i. Identification of user's location
      ii. Manual generation of alerts.
      iii. Alert notifications and their visualization on the map.
      iv. Alerts list and their visualization on the map.
      v. Driving View
   e. Driving App configurations
   f. DrivingApp Web Services
      i. Local Deployment
      ii. Deployment with Docker
   g. DrivingApp deployment with docker-compose

3.2.5.2 Material

➜ The material of modules 1 and 2 has been published in the following links:

     o English documentation: http://video-surveillance-application.readthedocs.io/en/latest/

     o Spanish documentation: http://video-surveillance-application-es.readthedocs.io/es/latest/

➜ The material of module 3 has been published in the following links:

     o English documentation: https://drivingapp.readthedocs.io/en/latest/

     o Spanish documentation https://drivingapp.readthedocs.io/es/latest/

     o DrivingApp Service specification: https://drivingappservice.docs.apiary.io/#

3.2.6 Module 6 "Developing FIWARE Data Models for Smart Services"

Duration: 45 minutes

Description: This module will illustrate how to develop a new data model to support your smart application and contribute it to FIWARE Community.

Audience: This course is oriented to programmers and developers with following previous knowledge: linux systems, cloud containers, virtualization, ROA, REST and SSH.

3.2.6.1 Agenda

1. Overview of FIWARE Data Models
2. How to develop and test a new FIWARE Data Model
   - Tools
   - Processes
   - Validation with the community
3. Example of under development models:
   - User Context model
   - User Alert model

3.2.6.2 Material

➜ SmartSDK contributed to the official repository of data models not only with new models but also with tools and documentation required for people willing to learn the contents of the aforementioned agenda. The documentation can be found at https://fiware-datamodels.readthedocs.io/en/latest/.

3.2.7 Module 7 "User's guide for Smart Spot Starter kit"

Duration: 45 minutes

Description: This module illustrate how to use open hardware to create your own smart spot (as the one used in Module 3 and 4).

Audience: This course is oriented to programmers and developers with the following previous knowledge: Linux systems, cloud containers, virtualization, ROA, REST and SSH.

Release date: June 2018

3.2.7.1 Agenda

1. Overview of Smart Spot

2. The ingredients
    a. Hardware used
    b. FIWARE Data models used
3. Connecting the sensors
4. Installing the software stack
5. Sending the data to the Context Broker

3.2.7.2 Material

→ Full documentation was provided on a public GitHub repository.
https://github.com/HOP-Ubiquitous/SmartSpot_SmartSDK_Firmware

4 EXPLOITATION AND INNOVATION

This section presents an overview of exploitation and innovations activities. These activities have a major focus in the second year of the project; still some initial achievements were reported during the first year.

4.1 Contributions to Open Source Communities and Standards

During the period from September 2017 to November 2018, SmartSDK delivered the following contributions to open source communities:

Contribution	Partner	Open Source Community
Helm chart for CrateDB	MARTEL	Helm / Kubernetes
QuantumLeap	MARTEL	FIWARE
Recipes	MARTEL, FBK	FIWARE
NGSI Encryption Layer as a Service	ITESM	FIWARE
Alerts Application	ITESM	FIWARE
Cloudino WiFi Connector and Cloudino GSM Connector	INFOTEC	N/A
AeroAllergenObserved data model	INFOTEC, MARTEL	FIWARE
SDK NGSI Library for Javascript	CENIDET	FIWARE
oHealth-Context data model	CICESE	FIWARE
MA-Test risk of fall application (showcase for the use of the oHealth-Contex data model)	CICESE	FIWARE
Green Route Frontend Application (map with real-time information allowing for ecological route planning)	UBI	N/A
Data models for the Security Scenario	INAOE, CENIDET, ITESM	FIWARE
Health Rehabilitation App	INAOE	FIWARE
ViVA and DrivingApp: modules for smart surveillance	INAOE, CENIDET, ITESM	FIWARE
IoT-Agent enabler	HOPU	FIWARE
Smart Spot Starter kit	HOPU	FIWARE

Table 6. Contributions to Open Source Communities.

During the period from September 2017 to November 2018, SmartSDK delivered the following contributions to standardization initiatives:

Contribution	Partner	Standardization Body
The "IoT Big Data Project" is one of the most relevant initiatives pertaining to the Internet of Things Programme runned by GSMA. Such initiative is aimed at developing different assets intended to enable an interoperable and scalable IoT and Big Data ecosystem: ➡ a reference architecture. Particularly, GSMA acknowledges the need of having a data broker element, similar to FIWARE's Context Broker.	FF, All	GSMA IoT Big Data project[3]

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[3] https://www.gsma.com/iot/iot-big-data/

→ a harmonised API that allows to publish and consume data coming from different data sources, namely IoT devices. It is important to note that GSMA has adopted as harmonised API FIWARE NGSIv2.

→ a specification of a set of harmonised data models, that formally describe what kind of entities and attributes can be used by data providers or data consumers.

→ an IoT Big Data Directory which allows mobile operators or other parties (for instance cities) to offer end points which publish interoperable data in accordance with the specifications mentioned above. Such (API) directory allows developers to discover new information providers around the globe, but following the same APIs and data models, thus enabling portability at data level.

With regards to harmonised data models, GSMA has published specifications of different data models in various domains, namely agriculture and smart cities. It is noteworthy, that there is compatibility between the data models published by GSMA and those developed by the FIWARE Data Models[2] project.

During the 2017-2018 period, the FIWARE Foundation has contributed data models developed under SmartSDK to the IoT Big Data project. Those data models have been migrated to the syntax and structure of the emerging NGSI-LD specification. The results have been published by GSMA under the following Github repository:

https://github.com/GSMADeveloper/NGSI-LD-Entities

In February 2017 ETSI launched a new Industry Specification Group (ISG) devoted to Cross-Cutting Context Information Management (CIM). The mission of this group is the development of APIs and data models that enable to publish, consume and subscribe to cross-cutting context information (including historical data), particularly in the domain of smart cities. FIWARE Foundation is the rapporteur of the API specification. NGSI-LD is a Group Specification developed by ETSI ISG CIM, intended to define an API to provide, consume and subscribe to context information in multiple scenarios and involving multiple stakeholders. It enables close to real-time access to information coming from many different sources (not only IoT). The OMA NGSI-9/10 information model, the root basis of FIWARE NGSI, is currently being evolved by ETSI CIM to better support linked data (entity's relationships), property graphs and semantics (exploiting the capabilities offered by JSON-LD). The resulting specification has been named NGSI-LD. It is noteworthy that the NGSI-LD information model is a generalization of the OMA NGSI-9/10 information model. As a result, it is expected a good level of compatibility and a clear		ETSI ISG CIM[4]

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[2] https://github.com/fiware/dataModels

[4] https://portal.etsi.org/tb.aspx?tbid=854&SubTB=854

migration path between both information models.
The following is a summary of the activities conducted:

- Attend weekly calls and physical plenary meetings of ETSI ISG CIM
- Technical contributions to the NGSI-LD specification:
  - Finalizing the Preliminary API version
    - http://www.etsi.org/deliver/etsi_gs/CIM /001_099/004/01.01.01_60/gs_CIM004 v010101p.pdf
  - Extensions to the query language
  - Pagination
  - Temporal Evolution of Entities API
  - Clarifications and amendments of the existing draft
  - Development of JSON Schema and OpenAPI Specification (Swagger). See https://forge.etsi.org/gitlab/NGSI-LD/NGSI-LD/tree/master/spec/updated
  - Rapporteur specific tasks (integration of contributions, word edition, etc.)
  - Contributions to the test suite of NGSI-LD https://github.com/Fiware/NGSI-LD_Tests
  - Development of a first proof of concept of NGSI-LD on top of Orion (NGSI-LD Wrapper) https://github.com/Fiware/NGSI-LD_Wrapper
  - Launch a FIWARE project to develop an extension to Orion Context Broker to support natively NGSI-LD https://github.com/Fiware/context.Orion-LD
  - Give support and guidance to the NGSI-LD implementers

Table 7. Contributions to standardization initiatives.

4.2 Engagement of start-ups

The original plan of the project was to support the establishment of an accelerator programme leveraging on the FINNOVA programme of Mexican Economy Ministry. Unfortunately, the programme is not active. Accordingly, the activities carried out were focused in the engagement of star-ups in in the technical part using the FIWARE platform to develop start-up projects. Therefore, a complete training plan was designed and implemented for FIWARE technology engagement. As outcome, 28 training events were organized for developers and integrators and Software and Hardware contributors generating 28 projects/prototypes developed by the FIWARE community in Mexico. Moreover, a set of resources (videos, articles and a TV program) was generated to promote FIWARE showing what is being doing in Mexico and other countries. In this way, we were looking to increase the interest of people in FIWARE and to encourage them to develop their own innovative applications based on FIWARE Generic Enablers.

In order to facilitate the adoption of FIWARE technologies, a training hands-on approach was implemented to provide high quality information on the FIWARE ecosystem and technical training materials to kick-start development with FIWARE components. This approach is described online, by means of a FIWARE guided-tour in Spanish[5]. In this way, developers have a tool to develop a smart solution by studying FIWARE in a self-taught way.

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[5] Available at http://fiware-training.readthedocs.io/es_MX/latest/

4.3 Engagement of cities

The engagement of Mexican Cities to FIWARE is one of the priorities of the project. Currently only two cities have been included in the OASC initiative. During the FIWARE talks presented at the Smart City Expo LATAM CONGRESS 2017, two municipalities reached out to start a potential engagement based on FIWARE's ecosystem. The first, Pachuca, expressed their interest based on the need they currently have regarding their public transportation system. The goal is to improve the public transportation system by developing an integral solution that will not only allow local authorities to ensure the routes are optimal, but also collect environmental data to measure pollutant levels throughout the city. The second municipality, León, expressed a need related to their water system due to serious problems with their pipelines and the distribution system. Even though the problem is not clear, the intention is to meet with other offices and develop a whole system that will track and record all data related to their water supply system. During the second year, dialogue with other cities was established. On the one hand, Toluca expressed interest in addressing issues related to video-surveillance based on FIWARE. On the other hand, Querétaro and Puebla showed their enthusiasm in exploring the areas of mobility and environmental monitoring using FIWARE. Nevertheless, due to political changes in Mexico, an agreement on the development of these projects was not reached.

4.4 Exploitation plans by partners

In this section, we report the initial exploitation plans of each project partner.

4.4.1 MARTEL

Martel, thanks to the SmartSDK project, has acquired new competences in the area of a Time Series data bases and Docker containers orchestration. Such competences have been leveraged in the products and services that Martel plans to provide around FIWARE technology:

➜ Results from the work on FIWARE recipes will be included in Martel products (Orchestra Cites) to support the deployment and management of Smart City services.

➜ QuantumLeap not only has been adopted by FIWARE as an official incubated core Generic Enabler, but it is a central part of the Orchestra Cities product and used to offer real-time analytics over smart city data.

➜ The acquired knowledge will be leveraged both in the FIWARE training offer and in the FIWARE commercial consultancy offer.

4.4.2 HOPU

Thanks to the SmartSDK project HOP Ubiquitous has been able to develop a new device specially designed for smart cities and ready to be added directly to the FIWARE Iot-Devices catalogue, in addition to the core device (Smart Spot), Hopu has developed some peripherals that add value to the product and provide new services to smart cities such as environment monitor, crowds monitoring, positioning or M2M communication through the LwM2M protocol.

The contributions that Hopu plans to make to the various FIWARE catalogues are as follows:

➜ A new device for the FIWARE IoT Ready devices catalogue. (Smart Spot), this device would have features and sensors specially designed for smart cities such as crowd monitoring and ambient data measurement.

➜ Improved IoT-Agent enabler to add capabilities such as LwM2M data mapper to multi-level FIWARE data models and lwM2M device mapping support to multiple instances of FIWARE data models within the Orion Context Broker, this improvement is key to the correct deployment of lwM2M devices in cities equipped with FIWARE technology.

➔ Collaboration in the creation of new FIWARE data models as can be the Smart Spot or the Smart POI (Point of interaction) data model.

4.4.3 UBI

Thanks to the SmartSDK project, Ubiwhere has been acquiring experience and competences in the Smart Cities area namely with the harmonisation of data models and integration of Generic Enablers with web and mobile applications, through Docker orchestration. The company's plans consist of leveraging know-how in the following solutions:

➔ Ubiwhere's smart cities solutions (Parking, Traffic, Air Quality, Waste Management and Mobility Backend-as-a-Service) have incorporated the FIWARE Harmonised Schema as the "official" data models and NGSI compliance at the southbound and northbound layers;

➔ Knowledge and lessons learned with FIWARE Recipes (mainly for data handling and subscription) will be included in the above-mentioned solutions for deployment and management;

➔ Improvement of Ubiwhere's routing engine to support public transportation (multimodal transportation, plus park-and-ride scenarios) besides private vehicles (car and bicycle).

4.4.4 FBK

In SmartSDK, FBK is actively working in the context of automatic deployment, operations and orchestration of containerized (Docker based) cloud-native applications. The work performed with the setup of a cloud environment (on the FIWARE Lab) based on OpenStack and Rancher will be used for advancing FBK knowledge and research in the workload management and orchestration domain offering the opportunity for technology transfer towards SMEs and/or industries willing to embrace the new containerization paradigm. In the last year FBK delivered some training sessions to local entities willing to embrace the containerization paradigm.

4.4.5 INFOTEC

Thanks to the SmartSDK Project, INFOTEC has generated a set of novel components and data models that will be very useful for the projects and services that INFOTEC develops with FIWARE technologies.

➔ Alert and Transportation data models that will be used for logistic applications.

➔ AeroAllergenObserved data model will be used for air quality applications.

➔ Components for data context management that will be the basis for merchandise monitoring in Mexican ports.

➔ Security mechanisms with Keyrock that will be used for other products that need to store the data of users in private way.

4.4.6 CICESE

CICESE has explored the use of FIWARE in the context of healthcare to deploy a set of tools (*i.e.*, software components) and standardised dataset, so data can be harmonised with third party resources.

The focus of this initiative is based on sensor data collection and a research perspective; implying that collected data will be store and process *a-posteriori*. The development is being settled-up based on the FIWARE cloud environment (*i.e.,* FIWARE Lab) opening the opportunity for this contribution to be adopted by other parties.

As proof of concept, CICESE in collaboration with INAOE has worked on three different scenarios: Estimation of the risk of fall, Rehabilitation at home, and Human-robot assistance detailed on D2.5. Projects has been leaded by PhD students towards promoting the adoption and dissemination of FIWARE technology within academic environments.

4.4.7 ITESM

Thanks to the SmartSDK project, both researchers and BS, MSc, and PhD students have increased their knowledge and capabilities in information and communication technologies (ICT). At the same time, collaboration with other Institutions and Enterprises, centered in the ICT sector, has been established thanks to the different events related to this initiative and the FIWARE platform.

ITESM keeps its compromise to exploit the potential of the FIWARE platform not only as a tool that allows researchers to foster their academic activities and current projects in development, but also as a means to generate new research and development proposals. To achieve these purposes, a research group from ITESM has been working on projects that use FIWARE as core: Transportation, Security and Encryption of user's data within a cloud environment, Computer Vision and 3D Scene Construction and Render optimization, Agrifood, Internet of Things, Fog computing, integration of Semantic Web Technologies in FIWARE's components, and Automated Testing of Cloud based components through Docker technology.

As complementary actions, the dissemination plan including talks, trainings, workshops, and hackathons has been executed in the ITESM community as well as in different Universities and Industries from México. Participation in meetings and IT-related sessions, with local organisms and organizations related to IT, were also important to both the dissemination and collaboration activities. Consequently, all these events helped to motivate a wide range of entities to join the FIWARE community.

Concerning the projects carried out internally by the research group from ITESM, several BS, MSc, and PhD students have been collaborating and centering their research and development efforts to contribute to the SmartSDK project and exploit the potential of FIWARE. The results of their efforts are concentrated in diverse research and project proposals abroad distinct research areas. For example, in research areas related to, but not limited, the Smart City, Smart Security, and Data Management Scenarios. It is noteworthy to mention that an academic paper elaborated in conjunction with HOPU and UCAM, published in the Sensors Journal, was a highlighted result of these activities.

Regarding the applications developed within SmartSDK, the following was achieved:

- An encryption/decryption service, named "Encryption Layer as a Service", was released. Its design, testing, and improvement have been addressed jointly with MARTEL. This service allows users of all up-to-date FIWARE data models to encrypt and decrypt their data. It was implemented as a REST service, making it available to everyone that wants to use it.
- An alerts application was released and integrated into the Smart City Scenario. Such an integration was worked in collaboration with INFOTEC, UBIWHERE, and HOPU. This application allows users to generate geolocated alerts concerning health, security, environment, SOS, traffic, and weather issues. The application was developed as a Progressive Web Application (PWA), making it available to everyone that wants to use it.
- A PWA is currently been under development in order to enhance the Encryption Layer as a Service. The aim pursued is the implementation of a second encryption/decryption algorithm and enabling the option to anonymize data contained in the FIWARE data models.

Finally, as future work, activities related to improving these applications as well as to explore more research areas where FIWARE can be used as a core are contemplated.

4.4.8 CENIDET

Thanks to the SmartSDK Project, CENIDET has generated a set of tools and components, which have been incorporated into the development of applications and services with FIWARE technologies.

The applications that CENIDET has developed with the FIWARE ecosystem are focusing on areas such as transporting, traffic detection and detection of wrong driving of vehicles. Others applications, have as purpose the interconnection of IoT mobile devices and the health monitoring through this devices.

The applications developed establishing communication with the FIWARE platform through the SDK components and Generic Enablers (GE) that provides the same platform. To achieve this communication, the components and generic enablers of FIWARE are integrated within the architecture of each application.

The research works of Masters and PhD students have boosted the FIWARE-based applications developing, resulting in papers publications with FIWARE technologies.

The research papers created from the FIWARE developments are focusing mainly on the generation of modules and libraries for the collection and treatment of context information. In addition, it has been implemented an IoT architecture with the DrivingApp Application, which uses the capabilities and components of the FIWARE platform.

The future activities of CENIDET within the SmartSDK project, are focusing mainly in enrich the use of FIWARE platform in the investigation and thesis projects, exploring other applications scenarios.

4.4.9 INAOE

INAOE, in collaboration with ITESM and CENIDET, has developed an intelligent video surveillance system that includes the definition of a cloud-based architecture for smart video surveillance and several algorithms. The proposed architecture considers two main components: ViVA (Web App) and Driving App (mobile app). Several papers have been published from the aforementioned work. Testing of the system has been executed in two scenarios: i) the INAOE campus and ii) the ITESM campus.

In addition, in collaboration with CICESE, we have complemented the set of Smart Health applications focusing on the topic of neurorehabilitation, and in particular with the development of an SmartSDK based cloud application to monitor bimanual activity from smartwatches recordings. These recordings, and using the newly proposed index of limb usage balance (ILUB) -ongoing validation- is intended to provide valuable information about arm usage of stroke patients while out of the rehabilitation ward, which currently remains an important gap in knowledge.

It is important to note that, both applications developed by the the INAOE team use the FIWARE framework.

4.4.10 FF

FIWARE Foundation is a non-profit association with the expected value to offer IoT-enabled solutions based on the FIWARE platform. FIWARE Foundation main purpose is to explain the potential reduction of OPEX using FIWARE technology and therefore increase the ROI of the companies working with this solution. Working together with numerous partners in both Europe and internationally, it gives FIWARE Foundation the possibility to extend the IoT ecosystem solutions beyond the scope of this project. The FIWARE Foundation will focus on ensuring quality, sustainability and exploiting the full potential of all those SmartSDK achievements, which will increase the potential of the FIWARE open platform. This means creating more awareness, at this stage, with a stronger focus on the commercial offering and references that show real-life cases based on FIWARE that illustrate the potential benefits and ROI.

5   CONCLUSIONS

During the second year SmartSDK project has been quite active in the dissemination and promotion of FIWARE and SmartSDK outcomes, as summarized in the following table:

Activity Type	Key Performance Indicator	Achieved PPR 2
Dissemination	Participation to relevant events	**21**
Dissemination	Presentation or demonstrations of SmartSDK	**26**
Dissemination	Number of yearly unique page views on SmartSDK web site	**5.835**
Dissemination	Number of scientific publications	**14**
Dissemination	Number of organized events (including FIWARE Talks)	**36**
Training	Number of trained start-ups and researchers in Europe and México	**113**
Training	Number of downloads of bi-lingual training material	**100**
Exploitation	Number of contributions to the international standardization activities	**2**
Exploitation	Number accepted contributions to Open Source communities	**3**
Exploitation	Number of new cities entering OASC	**0**

The second year of the SmartSDK project was very productive, the activities carried out were almost twice compared with the first year, and we achieved almost all the goals established. We participated in more than 50 events over the year, trained more than 100 researchers, published 14 scientific publications and we also published training material about the different applications developed during the SmartSDK project. Moreover, a set of resources (videos, articles and a TV program) was generated to promote FIWARE showing what is being doing in Mexico and other countries. This kind of material and activities increase the interest of people in FIWARE and promote to develop their own applications based on the FIWARE technologies.

ANNEX A

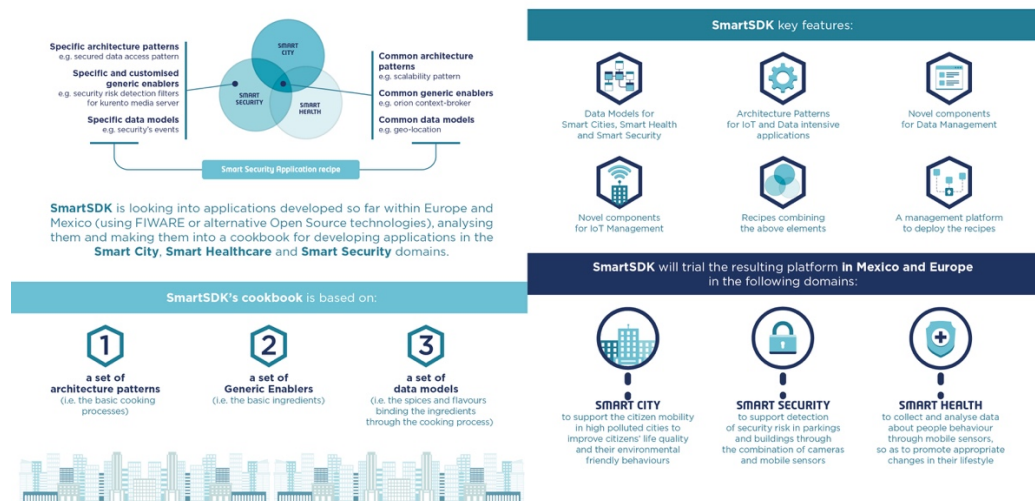*Figure 17. SmartSDK flyer, english version updated at March 2018: back and cover.*

Figure 18. SmartSDK flyer, english version updated at March 2018: inner pages.
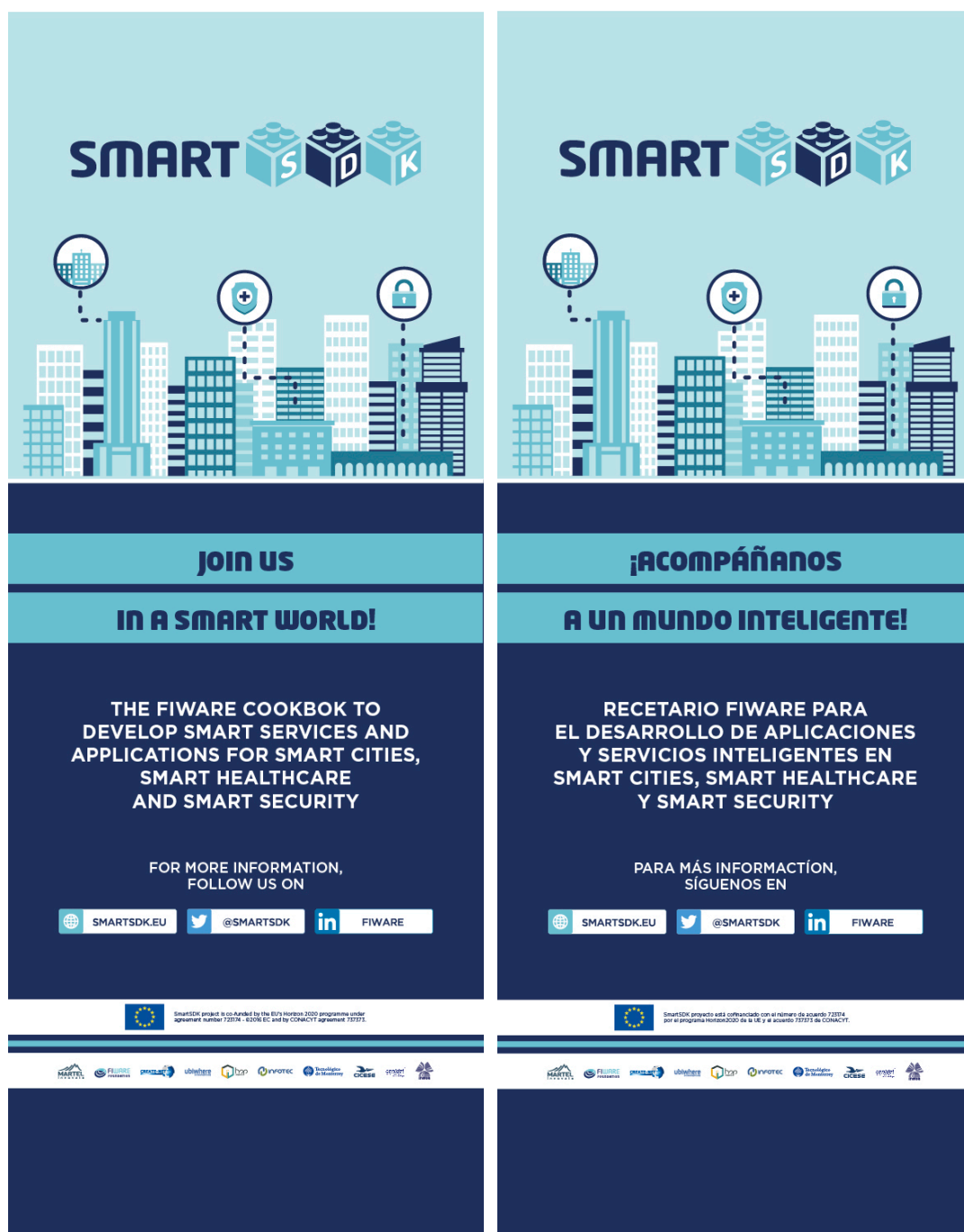

Figure 19. SmartSDK and Fiware business card.

Figure 20. SmartSDK roll-up: english (right) and spanish (left) version.