Annual report 2018

The Internet Research Center

i2cat

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Annual Report 2018

"i2CAT is committed to the digital transformation of the Catalan industry and society"

Jordi Puigneró i Ferrer
President of i2CAT Foundation
Minister for Digital Policy
and Public Administration
of the Government of Catalonia

Letter from the President

In 2018 i2CAT celebrated its 15th anniversary, marking **15 years of excellence and high quality work** at the service of the industry and Society. Its outstanding trajectory has ranked i2CAT **2nd in Catalonia** in the ranking of H2020 ICT Funding Grants **by the European Commission**, reaching 10M € between 2014 and 2018. i2CAT has been actively involved and has strongly contributed to the creation and growth of a research and innovation ecosystem in Catalonia in the field of advanced digital technologies, which is now is a recognised benchmark community in Europe.

In 2018 the strong commitment of the Government of Catalonia to research and innovation for designing the future digital society, has resulted in the creation of the Ministry for Digital Policy and Public Administration, and, for the first time, the Minister for Digital Policy and Public Administration of the Government of Catalonia holds the Presidency of i2CAT.

With regard to knowledge creation, i2CAT has not only strengthened its leading position in Europe in the fields of **5G** and i**mmersive technologies**, but it has also constantly challenged new opportunities in order to seize new capabilities and technologies such as **Artificial Intelligence**, **Blockchain** and **Cybersecurity**. For instance, i2CAT coordinates a new European project that combines 5G and cybersecurity, which aims to address connected and autonomous vehicle challenges. i2CAT is also very well positioned in terms of **Internet of Things**, leading the application of the **Emerging Technologies Community** in IoT, as a partnership among research and innovation centres specialized in IoT which work together to face common challenges in the IoT.

i2CAT fosters **public-private initiatives** to develop new technologies in a collaborative way. In 2018, the centre has driven the creation of the strategic public-private initiative: **5G Barcelona** that works to transform the metropolitan area of Barcelona into an open city-wide lab for the validation and adoption of 5G technologies and applications in real-life environments. 5G Barcelona aims at creating synergies within the ecosystem and offers an experimental infrastructure to test, prototype and implement new digital solutions. i2CAT is also one of the founders of **The Thinx|5G Barcelona** Laboratory, an open laboratory that acts as a product accelerator for companies to test technologies and telecommunications networks where they will operate in the future.

i2CAT is developing activities to promote strategic initiatives aligned with the Administration's digital policy and aiming to improve the business sector.

The project **Boost of the digital and mobile transformation**, co-funded by the European Regional and Development Fund (ERDF), is executing several actions to promote the development and adoption of emerging technologies by the ICT sector, and to deploy trials aiming to validate and apply digital innovations in strategic sectors like Health, Industry and Cities. In this sense, i2CAT is also working in the creation of an IoT Digital Innovation Hub to centralize the identification of challenges and needs from companies, specially SMEs, and to facilitate the best solutions in collaboration with partners from the Catalan IoT ecosystem.

i2CAT involves the citizen as a central player for the digital transformation of the society.

Several initiatives have been promoted in order to empower citizens. For example, i2CAT has lead the *Digital Citizen Laboratory* which aims to be a digital policy laboratory open to collaboration among the citizens and governments (Digital Policy Lab). It is a collaborative platform between the Administration and the citizens to define policies to promote an advanced digital society.

Over 15 years, i2CAT has continuously reinforced its strategic role in the implementation of the digital policy in Catalonia, making it to an internationally recognised centre that promotes trials and developments in the latest fields of technology application. From the Government of Catalonia we are determined to keep promoting the talent and knowledge in strategic digital technologies, to reinforce our industries and enhance our competitive sectors, which will help us achieve a greater digital transformation in Catalonia.

Congratulations to i2CAT team for the milestones achieved in 2018. I strongly encourage you to keep advancing and contributing to a digital and inclusive society!

2018 Highlights

Some of the relevant facts and milestones achieved in 2018 have been:

Celebrating the center's **15th anniversary.** During these years i2CAT, thanks to its excellence and activities, has contributed to the creation of a benchmark ecosystem of research and innovation in the field of Internet and advanced digital technologies.

For the first time the Presidency of the i2CAT Foundation is held by the **Minister for Digital Policy and Public Administration of the Government of Catalonia**

Achievement of **39%** (2015-2018) **rate growth** reaching an income of 5.1 M€.
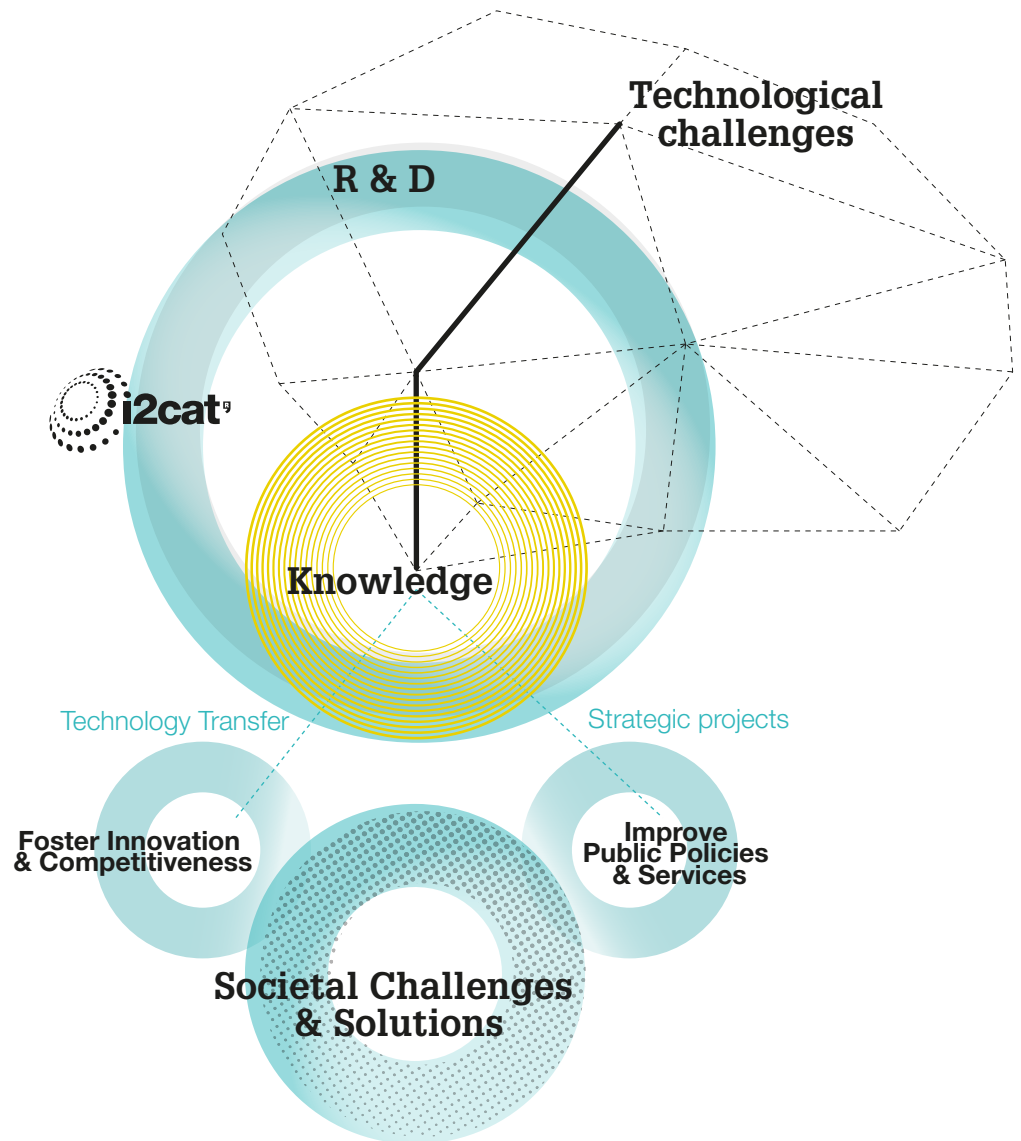
Strenghtening the center's **leading position** in the research and development of **5G** and **VR** technologies, both at a local and International scale. I2CAT has also faced new challenges in **Cybersecurity, Blockchain, Artificial Intelligence**. Additionally to the European R&D projects development with a total number of 22, the center has been granted with a coordinated H2020 project that address modern vehicle cybersecurity challenges applying advanced Artificial Intelligence and Machine Learning techniques.

Fostering **public-private initiatives**. It has been also one of the founding members and technical coordinators of the **5G Barcelona** initiative and The **Thinx|5G Barcelona**.

i2CAT has contributed to draw and carry out initiatives conceived to foster the innovation from within the **Public Administration** and other public bodies as SmartCatalonia strategy. In 2018 i2CAT has also collaborated with the Centre for Information Security of Catalonia (CESICAT) and the Centre for Telecommunication and Information Technologies (CTTI).

Collaborating with more than 22 companies providing R&D services in fields like **connected car, indoor positioning, smart home, social care, smart connectivity.**

Enhancing the promotion of the relevant innovations outcome from the center's research projects that have potential to reach the market. i2CAT has worked in 7 **assets** to be exploited in the market ans show some of them in International industry events. It has also participated in field trials as **5G Connected Car** and **5G Connected Ambulance.**

Technological challenges

R & D

i2cat

Knowledge

Technology Transfer

Strategic projects

**Foster Innovation
& Competitiveness**

**Improve
Public Policies
& Services**

Societal Challenges
& Solutions

15th Anniversary of i2CAT

i2CAT turned 15 on September 23rd 2018. During these years i2CAT has grown and evolved facing new challenges every day and reaching new goals.

i2CAT has contributed to the creation of an ecosystem of research and innovation in the field of Internet and advanced digital technologies that is a benchmark in both Catalonia and Europe. This ecosystem, thanks to its excellence, has become one of the research and innovation ecosystems capable of attracting more European funding to the country.

This institutional milestone and success are being celebrated through initiatives that involve not only the team but the ecosystem of i2CAT, formed by partners of the different environments where i2CAT is actively contributing.

In December 2018 were presented the events that during 2019 will take place to celebrate the "i2CAT year", with several activities focused on the following topics: talent and digital citizens, present and future of the digital research in Catalonia and Europe, and digital transformation.

President of the Board

The **Minister for Digital Policy and Public Administration** of the Government of Catalonia has been appointed as President of the i2CAT Foundation. For the first time the President of i2CAT is a Minister of the Government.

Generalitat de Catalunya
Departament de Polítiques Digitals i Administració Pública

Boost of Digital and Mobile Transformation Programme

This initiative is fully aligned with one of the main objectives of i2CAT which is to increase the impact generated by its research and innovation activities in the society, and aligned with the strategic policies and initiatives of the Digital Policy Strategy of the Government of Catalonia, as:

• SmartCatalonia Laboratory
• SmartCatalonia Challenge
• IoT Catalan Alliance
• Digital Citizenship Laboratory
• Catalonia 5G strategy
• Catalonia Artificial Intelligence Strategy
• Blockchain Strategy for the Public Administration

5G Barcelona

Drive and technological leadership of 5G Barcelona
In January 2018 was launched the 5G Barcelona initiative, a public-private partnership working to transform the metropolitan area of Barcelona into an open city-wide lab for the validation and adoption of 5G technologies and applications in a real-life environment.

It additionally creates synergies within the ecosystem and offers an experimental infrastructure to test, prototype and implement new digital solutions.

i2CAT is leading the technological activities of 5G Barcelona, in coordination with the rest of the other founding members: Government of Catalonia, Barcelona City Council, Mobile World Capital, UPC University, CTTC and ATOS.

Under 5G Barcelona, i2CAT has been actively involved in two strategic activities:

Set up and technological coordination of The Thinx|5G Barcelona Laboratory
The Thinx 5GBarcelona is a laboratory that acts as a product accelerator, accepting and streamlining the transfer of knowledge of LTEM and NBIoT that will form part of 5G and that are currently the only technologies that accept case studies of 5G LPWA. It offers the possibility of validating the technology in a telecom operator infrastructure reducing the time-to-market.

In collaboration with:

Deployment of the field trial 5G Connected Car
The connected car pilot was shown in the streets surrounding the Mobile World Congress Barcelona during the days of this reference event. It was based on the 5G and other technologies that allow communication among the car, the infrastructure and the rest of the vehicles.

This connectivity provides predictive information to drivers to streamline and improve their decisions improving the road safety.
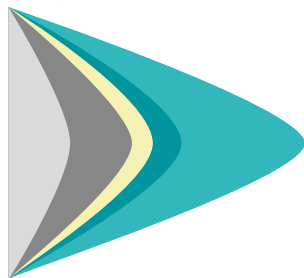
In collaboration with:

Facts & Figures

Funding

Income breakdown (%):

Core funding Government of Catalonia	10%
FEDER Programme	7%
Competitive Funds	44%
R & D Services	20%
Business & Entities Project Contributions	19%

5,1 M€

Staff

Research and Development	35
Innovation	13
Support R&D Staff	7
Administration and Management	7

62 employees

24% PhD

Growth Rate

+39%

2015 – 2018
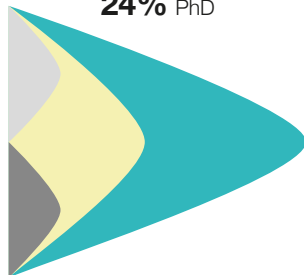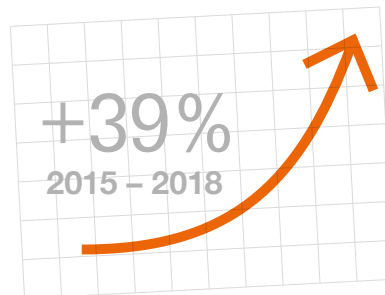
Projects

Number of R&D Projects

Services to Companies	37
Competitive Funds	31
Strategic R&D Projects with Public Administration	15

R&D Services to Companies

International	24%
National	76%

R&D Competitive Funding Projects

International	86%
National	14%

R&D Project Proposals

+88

Publications

+37

Demos at International Fairs & Congresses

+15

Keynotes, workshops & Round tables

+53

Organization of commercial & Technological events

+20

Commercial fairs

Technological fairs & Congresses

Media Impacts

+487

Some of the activities carried out along the year had visibility in the Media.

Excellence & Knowledge

10,5 M€

Granted by the European Commission in the 2014-2018 period within the Horizon 2020 programme rewarding i2CAT's quality research and remarkable achievements.

Leadership in H2020 European Research Projects

i2CAT has continued leading European research projects in the fields of:
• 5G
• IoT
• Virtual Reality
• Recursive Internetwork
• Architecture (RINA)

The center has faced new research and innovation challenges in:
• Cybersecurity
• Blockchain
• Artificial Intelligence

H2020 Projects

in 2018 i2CAT participated in 22 European projects, including:

4 R&D European Projects
coordinated by i2CAT

Executed during 2018

VRTogether

ImAc

5GCity

Granted in 2018

CARAMEL

Distributed Artificial Intelligence research line

In 2018 i2CAT has started to foster the application of Artificial Intelligence technologies to create intelligent connectivity services and solutions, focused on use-cases of 5G networks, Internet of Things, Cybersecurity and Internet media contents.

NEM Vice-chair for Strategy

On November 2018, the NEM (New European Media Initiative) Steering Board appointed i2CAT as the NEM Vice-chair for Strategy for the upcoming period of two years.

nem

5G opportunities to satellite communications

New paths have been opened up to leverage the possibilities of 5G and satellite communications within the satellite sector.

i2CAT has focused on fostering the implementation of solutions enabling the "plug and play" integration of satellite communications in 5G networks.

Active involvement in the European emerging technologies community

i2CAT has led the application of the Emerging Technologies Community in Internet of Things, FEM IoT, as a cluster of research and innovation centers specialized in the next challenges of the IoT, such as: consumption, density, speed. This group has proposed two projects that value the research assets of the participants, with a budget of more than 4 million euros. This initiative reinforces the relationship of i2CAT with the technology supply sector stakeholders and the future implementation of the Digital Innovation Hub in IoT, which will gather all the technology demand in this sector.

Active H2020 R&D Projects

BOOST 4.0 (GA Nº 780732) **Big Data**

Scale-EUP2p (GA Nº 780842) **Innovation, IoT**

MUV (GA Nº 646456) **Big Data, Digital Social Innovation**

O4C (GA Nº 687818) **Digital Social Innovation**

ImAc (GA Nº 761974) **VR, Immersive Technologies**

ImmersiaTV (GA Nº 688619) **VR, Immersive Technologies**

VRTogether (GA Nº 825050) **VR, Immersive Technologies**

5GCroCo (GA Nº 825050) **5G**

5G-PICTURE (GA Nº 762057) **5G**

5G-XHaul (GA Nº 671551) **5G**

FLAME (GA Nº 731677) **5G, Experimental platforms Technologies**

GrowSmarter (GA Nº 646456) **IoT**

ARCFIRE (GA Nº 687871) **RINA**

5GCITY-H2020 (GA Nº 761508) **5G**

5G-ESSENCE (GA Nº 761592) **5G**

CYCLONE (GA Nº 644925) **Cloud networking**

Fed4FIREplus (GA Nº 732638) **Experimental platforms**

GN4-2 (GA Nº 731122) **SDN**

SaT5G **5G**

SESAME-H2020 (GA Nº 677596) **5G**

SHIELD (GA Nº 700199) **Cyber Security, Big Data**

SONATA (GA Nº 671517) **5G**

Partnering with Administration for the digital transformation of society

Initiatives aligned to the SmartCatalonia Strategy

i2CAT is collaborating in the following projects created under SmartCatalonia strategy:

IoT Catalan Alliance
13 new members, reaching a **total of 105**.

Public administrations play a key role in the digital transformation of society.

During 2018 i2CAT has been collaborating with the Government of Catalonia and other public administrations in different initiatives that pursue the following goals:

• Increase and consolidate the ICT sector in Catalonia.
• Improve the efficiency and competitiveness of the productive sectors through digital transformation.
• Increase the impact generated by research and innovation on the quality of life of citizens.

SmartCatalonia Laboratori

Smart solutions implemented in 6 cities including mobility pilot with BusUp implemented in 7 Catalan cities.

SmartCatalonia Challenge

30 smart solutions identified for the sectors:

• environmental policies
• citizen security
• social services
• commerce

Other relevant initiatives developed during 2018 with public administrations

Vincles BCN

i2CAT is collaborating with the Social Rights Area of the Barcelona City Council in the development of the Vincles BCN programme, an initiative to help the the elderly lead more active and sociable lives. The programme aims to bridge the digital divide, which particularly affects the this sector of the society, as well as improving the quality of life by using new digital technologies as a means of communication with people's local environment. i2CAT has developed the Vincles BCN mobile app that elderly citizens and relatives use.

Digital Citizenship Laboratory (LCD)

i2CAT leads this initiative in collaboration with the Digital Policies Department of the Government of Catalonia, and it is devoted to build a first digital policy laboratory open to collaboration among the citizenship and their governments (Digital Policy Lab). The LCD research and innovation program is centered on citizen digital sovereignty, the digital rights and duties that derive from it, the new forms of digital democratic action, and the civic technologies that they entail. That is to say in the new digital policies that help to shape the new digital society.

The LCD is a collaborative structure between the Administration and the citizens to help defining policies in favour of an advanced digital society.

Blockchain Strategy

i2CAT is an active member of the workgroup that is defining the Blockchain strategy for the public administration, an initiative that promotes the implementation of blockchain technology in the activity of the Catalan public administrations, with the following objectives:

a) position Catalonia as a leader in the use and development of blockchain technology
b) promote the use by the Public Administration of blockchain technology to offer better services and with more transparency

Innovation to generate value

i2CAT has continued working on transforming the outcomes and the knowledge achieved from research activities in assets that bring value and benefits to the society and the economy.

The center is focused on:

- Working to **generate assets**
- Setting up and **developing strategic alliances** with companies and entities to foster their digital transformation.
- **Co-development of R&D projects** with companies.

Co-development of R&D projects

During 2018 i2CAT has collaborated with more than 22 companies providing R&D services in fileds like **connected car, indoor positioning, smart home, social care, smart connectivity**.

Asset generation

i2CAT has been working in these main assets and technologies that have potential to be exploited in the market.

Some of i2CAT's **current assets**

Talent - Terrestrial Satellite Resource Coordinator

It is an end to end satellite terrestrial resource orchestration solution that provides a single and easy to use point of interaction for all stakeholders involved in the ecosystem, i.e. terrestrial and satellite operators as well as different 5G verticals.

The solution covers end to end service management over cloud and edge computational resources and it is completely in line with 3GPP and ETSI architecture, extending it towards satellite systems.

NHP – 5G Neutral Host Platform

A neutral and agnostic platform that allows telecoms and operators the distribution of aggregated multiple bandwidths in a specific area and that is covered by a cellular SmallCell.
It is a standardized and programmed solution, which implements flexible network and architecture resources and creates more effective and affordable infrastructure compared to a hardware and vertical solution.

VLP – Visible Light Positioning

The i2CAT VLP is a high precision indoor positioning solution based on visible light communications (VLC). A modulated LED light source is used to transmit codes that contain information on the position of the light fixture to a camera.

By means of a receiver with a CMOS camera or Image Sensor (IS) (smartphone or embedded system), an application library (SDK) is able to read the position codes and use this information to calculate a 3D position and the orientation of the receiver.

Innovation activities in collaboration with companies and entities

Catalonia wants to become a reference digital hub in Europe, betting on research and innovation as the driving force behind the digital transformation of society. i2CAT, as a strategic partner for the digital policies of the Government, has contributed to draw and carry out initiatives conceived to foster the innovation from within the public administration and other public bodies. In 2018 i2CAT has collaborated with the Centre for Information Security of Catalonia (CESICAT) and the Centre for Telecommunication and Information Technologies (CTTI).

Generalitat de Catalunya
Centre de Seguretat de la Informació de Catalunya

Generalitat de Catalunya
Centre de Telecomunicacions i Tecnologies de la Informació

i2CAT in the Media

Our projects and initiatives received strong interest from the media in 2018. Here is a selection of remarkable pieces featuring the i2CAT Foundation.

TV3 – The Government of Catalonia, Barcelona City Council, i2CAT, Mobile World Capital Barcelona, CTTC, Atos and UPC and present the initiative 5G Barcelona

https://www.ccma.cat/tv3/alacarta /telenoticies/telenoticies-migdia-09012018 /video/5715366/

El País – Barcelona presents its candidacy to be a European 5G lab

https://elpais.com/ccaa/2018/01/09/ catalunya/1515505030_498408.html

Betevé – 5G, the technology that will define Mobile World Congress and the years to come in Barcelona

https://beteve.cat/el-mati-de-barcelona- 910fm/5g-la-tecnologia-que-marcara-el- mobile-world-congress-i-els-propers-anys- de-barcelona/TV3 - 5G, one of the key topics in MWC, will be a reality in 2020

https://www.ccma.cat/tv3/alacarta/ telenoticies/el-5g-un-dels-temes-estrella-del- mwc-que-no-sera-realitat-fins-el-2020/video /5739751/

La Vanguardia – FC Barcelona suppports the 5G Barcelona initiativetechnologies

https://www.lavanguardia.com/local/ barcelona/20180228/441150293904/el-fc- barcelona-apoya-la-iniciativa-5gbarcelona.html

El Mundo – MWC: Operating on a patient remotely is possible with 5G

https://www.elmundo.es/cataluna/2018/02/28/ 5a970a04ca4741354b8b45a1.htmll

Expansión – Acciona, Mobile World Capital Barcelona and Orange promote the use of 5G in industrial projects

http://www.expansion.com/agencia/europa_ press/2018/02/28/20180228153219.html

Betevé – Transforming streetlamps into cell antennas, a pilot test under the 5GCity project

https://beteve.cat/ciencia-i-tecnologia/5gcity- fanals-antenes-telefonia-prova-pilot/

El Punt Avui – Megacities: Citizen labs for the 21st century?

http://www.elpuntavui.cat/economia/article/18 -economia/1353161-ciutats-desbocades.htm

La Vanguardia – The Liceu Theatre will record in 360º the opera of 'Romeo y Julieta'

https://www.lavanguardia.com/cultura/ 20180131/44433708684/liceu-grabacion- 360-grados-romeo-julieta.htmll

La Vanguardia – Around twenty companies receive 3.8 million euro in FEDER funds for R&D projects

https://www.lavanguardia.com/vida/20180619/ 45266944535/veintena-empresas-de-servicios -reciben-38-millones-de-fondos-feder-para- id.html

Diari Ara – Barcelona: Start-ups attract multinational companies

https://www.ara.cat/economia/Barcelona- start-up-atrau-multinacional_0_2026597384.html

Satellite Today – iDirect, SES, Broadpeak, i2CAT and the University of Surrey, members of the SaT5G consortium, have demonstrated a major milestone in the research, development and validation of key principles for satellite integration with 5G architecture

https://www.satellitetoday.com/telecom/ 2018/06/19/sat5g-hit-milestone-with-satellite- 5g-integration-demonstration/

Finanzas.com – The i2CAT Foundation consolidates its technological leadership with 4.85 million euros in revenue in 2017

http://www.finanzas.com/noticias/economia/ 20180712/fundacion-i2cat-cerro-2017- 3874674.html

Comunicacio21.cat – The GrausTIC awards acknowledge the work of 'Popap' and the i2CAT Foundation

http://comunicacio21.cat/noticies- comunicacio21/129328-els-premis-graustic- guardonen-el-programa-popap-i-la-fundacio- i2cat

La Vanguardia – Barcelona and Telefónica open the 5G laboratory The Thinx

https://www.lavanguardia.com/local/ barcelona/20180926/452043751391/ barcelona-telefonica-abre-the-thinx-laboratorio- 5g.html

El País – Barcelona will be a 5G testbed on the next Mobile World Congress

https://elpais.com/ccaa/2018/12/15/ catalunya/1544903130_397095.html

Aldia.cat – The i2CAT Foundation celebrates its 15th anniversary with a series of conferences on innovation

https://www.aldia.cat/espanya/noticia- fundacio-i2cat-celebra-seu-xv-aniversari-amb -diverses-jornades-dinnovacio-2019- 20181210133419.html

Diari Ara – The 5G car parked at Mobile

https://www.ara.cat/tecnologia/cotxe-del- aparca-al-Mobile_0_2186181407.html

ara

25 Febrero, 2018

MOBILE WORLD CONGRESS 2018

Un visitant consultant
el telèfon mòbil durant
l'edició celebrada a
Barcelona el 2016.
ALBERT GEA / REUTERS

El 5G impulsa el Mobile

La cinquena generació de la telefonia mòbil surt del laboratori i Barcelona vol ser-ne líder a Europa

PAULA SOLANAS
BARCELONA

El 5G arriba a la majoria d'edat i ho vol celebrar sense deixar-se-la en una de les cites de l'any de l'univers tecnològic. La nova generació de telecomunicacions mòbils serà protagonista indiscutible en aquesta edició del Mobile World Congress, la 13a que es celebra a Barcelona i la més marcada pel context polític que es viu a Catalunya. Dos anys abans del 2020 –la data prevista per a la seva aterrage comercial– operado-

res i fabricants faran gala al congrés dels seus primers projectes dissenyats per a la xarxa del futur.

Què és el 5G i per què genera tanta expectativa? Com si es tractés de l'evolució d'una espècie animal, la primera generació de la telefonia mòbil ens va portar les trucades de veu sense fil; la segona, els missatges de text; la tercera, les dades mòbils; i finalment, la quarta va disparar la velocitat d'internet i l'streaming. "Ara la cinquena neix com a resposta a l'expectativa que el trànsit a la xarxa creixerà com mai" explica Josep Vidal, professor investigador

teories del senyal i les telecomunicacions a la UPC. Aquest expert recorda que el desplegament del 5G té a veure sobretot amb l'arribada de nous serveis que fins ara no eren possibles. Així doncs, les millores sobre el 4G implicaran un augment de la velocitat i descàrregues que multiplicaran per 100 la potència actual. Això permetria, per exemple, que els serveis de streaming del món audiovisual deixin enrere el temut buffering –quan un vídeo no es carrega prou ràpid i necessita aturar-se– i facilitarien l'adopció massiva de les experiències de realitat virtual.

Aquesta rapidesa també es pot aplicar en moments en què la concentració de persones no permet er serviri els dispositius mòbils a ple rendiment, com ara en camps de futbol o concerts.

A més de la velocitat, el 5G també promet reduir la latència, és a dir, el temps de resposta de la xarxa quan emetem o esperem rebre un senyal. El responsable del projecte 5GBarcelona de la fundació Mobile World Capital, Tameu Sabater, explica que aquest és el punt crític per a l'anomenada indústria 4.0 i sectors com el del cotxe connectat o sense con-

Serveis

El 5G serà
cabdal per a
l'internet de
les coses i
el cotxe
connectat

Dos anys per convertir proves pilot en prototips comercials

Jordi Puigneró
SECRETARI DE TELECOMUNICACIONS DE LA GENERALITAT

La Generalitat ha sigut la impulsora d'una candidatura perquè Barcelona es converteixi en el laboratori europeu d'aquest nou internet. 5GBarcelona uneix l'Ajuntament de Barcelona i centres de recerca com la UPC, el CTTC o Atos. "La UE vol que cada estat membre tingui una ciutat 5G i a nosaltres ens ajuda tenir el Mobile i el moviment tecnològic que hi ha a Barcelona", explica el secretari de telecomunicacions de la Generalitat, Jordi Puigneró. Segons diu, aquesta aposta pot tenir un impacte positiu en la creació de nous llocs de feina qualificats.

Antonio Coimbra
CONSELLER DELEGAT DE VODAFONE ESPAÑA

La teleco britànica ja va centrar les seves novetats durant el congrés de l'any passat en les prestacions 5G que ja era capaç de reproduir sobre una xarxa 4G optimitzada. Aquesta setmana l'operador ha fet la primera trucada del món amb tecnologia 5G mentre Telefónica anunciava la creació de laboratoris a Segòvia i Talavera de la Reina.

Sergi Figuerola
DIRECTOR DE TECNOLOGIA D'I2CAT

Catalunya s'ha adjudicat –amb l'i2CAT– 22 dels 37 projectes europeus en 5G. El seu director de tecnologia, Sergi Figuerola, creu que convertir Barcelona en un pol de recerca del 5G "seria un tractor per si sol" i que caldrà treballar perquè això no esberli la bretxa digital ni tingui un impacte social perjudicial.

LA VANGUARDIA

22 Octubre, 2018

22 empresas trabajan ya en Catalunya para lanzar el 5G

Barcelona empezará cuatro proyectos piloto en febrero

ROSA SALVADOR
Barcelona

Catalunya quiere aprovechar la presencia del Mobile World Congres y de la Mobile World Capital en Barcelona para posicionarse a la vanguardia del desarrollo de la nueva tecnología 5G. Según un informe elaborado por Acció y por el Departamento de Polítiques Digitals de la Generalitat, Catalunya cuenta ya con 22 empresas trabajando en el desarrollo del 5G, de las que nueve son empresas locales que están desarrollando soluciones informáticas y tecnológicas para poder dar utilidad práctica a la nueva tecnología: Accent, Engidi, Watchity, Visyon, World Sensing, SenseFields, Enide, Volta y NBYComp.

Daniel Marco, director de Smart Catalonia de la conselleria, explicó que el ecosistema 5G de la ciudad está liderado por los grandes operadores: Vodafone, Orange, Cellnex, MasMovil y especialmente Telefónica que tiene en la ciudad un laboratorio 5G. Junto a ellos están las grandes tecnológicas que les suministran equipos y los desarrollan ahora a medida, como Nokia, Juniper, Cisco, Ericsson y Huawei, e integradores, especialmente Atos, que tiene un centro de desarrollo para el 5G en Barcelona. Atos, que gestiona un proyecto europeo en la ciudad, es además la única empresa privada que forma parte de la iniciativa "5G Barcelo-
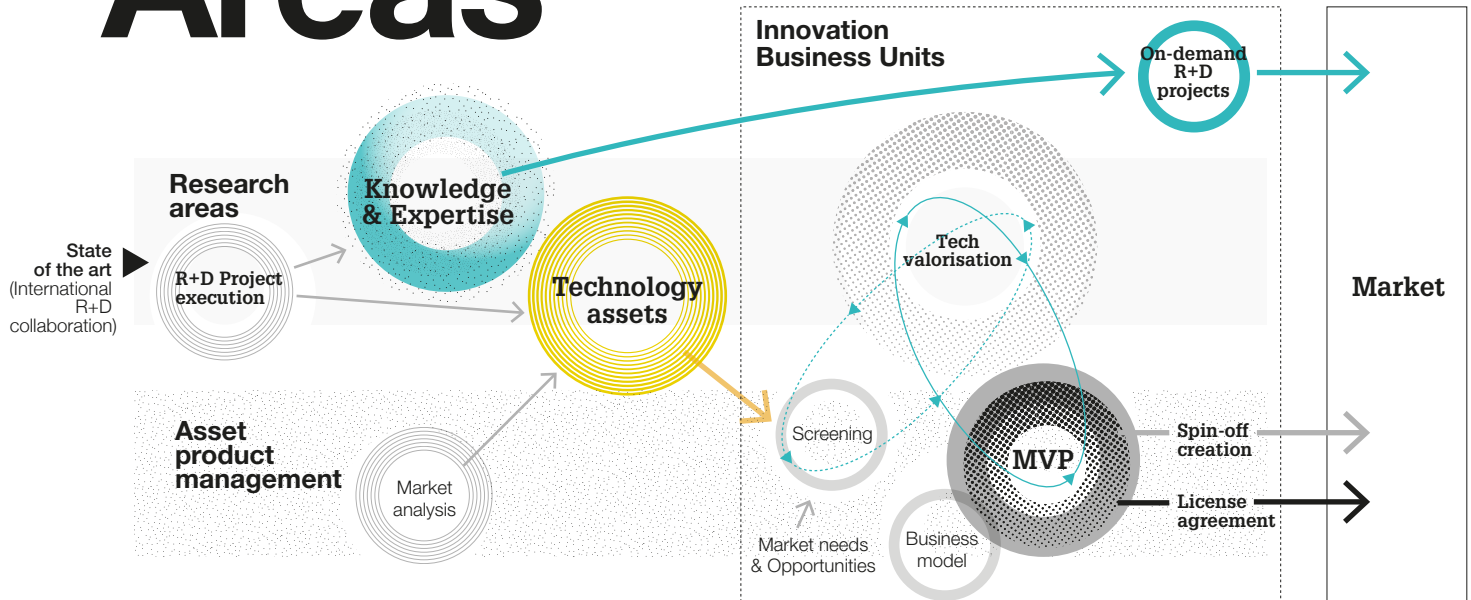
na", un convenio de colaboración para impulsar la nueva tecnología suscrito por el Ayuntamiento, la Generalitat, las fundaciones MWC e i2cat, el Centre de Telecomunicacions y la UPC.

Marco explicó que "el 5G no llegará al mercado hasta el 2020 y ahora está en fase de laboratorio. Sin embargo, tenemos cuatro

proyectos que serán reales y estarán en marcha, aunque en fase piloto y precomercial, ya en febrero, coincidiendo con el congreso de los móviles".

El proyecto más avanzado lo desarrolla el Clínic con Vodafone, y permitirá a un cirujano dirigir en tiempo real una operación quirúrgica realizada a distancia por otro profesional. Telefónica, con Seat, conectará una calle para que circule un coche autónomo; Orange, con Acciona, desarrolla el control remoto de robots industriales en obra civil y centros logísticos; y Accelleran, con Cellnex, desarrolla un proyecto de small cells en Poble Nou, financiado por la Unión Europea.●

El Centre de Telecomunicacions lidera varios proyectos 5G
LLIBERT TEIXIDÓ / ARCHIVO

El 5G está en fase de laboratorio, y los proyectos piloto no llegarán al mercado al menos hasta el 2020

Research Areas

Innovation Business Units

State of the art (International R+D collaboration)

Research areas

Knowledge & Expertise

R+D Project execution

Technology assets

On-demand R+D projects

Asset product management

Market analysis

Tech valorisation

Screening

MVP

Market needs & Opportunities

Business model

Spin-off creation

License agreement

Market

Each research area in i2CAT masters certain areas of knowledge and owns a set of assets: software and/or platforms with a clear roadmap and added value that solve a specific problem. Such assets and expertise are not only key to get competitive research and innovation projects, but also can potentially be transferred to the market or be the basis of private service contracts with companies. To accomplish that goal, i2CAT research areas work in close cooperation with the innovation business units as well as the Asset and Product Manager.

i2CAT's excellence in research, both international and local, grants a key role in the EU Framework program for Research & Innovation.er.

Publications
37

In 2018 the research areas produced 37 scientific contributions. These publications included:

Conferences

M. Grandi, D. Camps-Mur, A. Betzler, J. Josep Aleixendri, M. Catalan-Cid, **"SWAM: SDN-based Wi-Fi Small Cells with Joint Access-Backhaul and Multi-Tenant Capabilities"**, IEEE/ACM International Symposium on Quality of Service (IWQoS), Banff, 2018.

E. Grasa, L. Bergesio, M. Tarzan, D. Lopez, S. van der Meer, J. Day, L. Chitkushev, **"Mobility management in RINA networks: Experimental validation of architectural properties,"** 2018 IEEE Wireless Communications and Networking Conference (WCNC), Barcelona, 2018.

M. Montagud, I. Fraile, J. A. Núñez, S. Fernández, **"ImAc: Enabling Immersive, Accessible and Personalized Media Experiences"**, ACM International Conference on Interactive Experiences for Television and Video (TVX), Seoul, 2018.

H. Attak, M. Combalia, G. Gardikis, B. Gastón, L. Jacquin, A. Litke, N. Papadakis, D- Papadopoulos and A. Pastor, **"Application of distributed computing and machine learning technologies to cybersecurity"**, Computer & Electronics Security Applications Rendez-vous (C&ESAR), Rennes, 2018.

T. Soenen, S. Van Rossem, W. Tavernier, F. Vicens, D. Valocchi, P. Trakadas, P. Karkazis, G. Xilouris, P. Eardly, S. Kolometsos, M.-A. Kourtis, D. Guija, S. Siddiqui, P. Hasselmeyer, J. Bonnet and D. Lopez, **"Insights from SONATA: Implementing and integrating a microservice-based NFV service platform with a DevOps methodology"**, 2018 IEEE/IFIP Network Operations and Management Symposium (NOMS), Taipei, 2018.

Journals

K. Liolis, A. Geurtz, R. Sperber, D. Schulz, S. Watts, G. Poziopoulou, B. Evans, N. Wang, O. Vidal, B. Tiomela Jou, M. Fitch, S. Sendra Diaz, P. Sayyad Khodashenas, N. Chuberre, **"Use cases and scenarios of 5G integrated satellite-terrestrial networks for enhanced mobile broadband: The SaT5G approach"**. Int J Satell Commun Network. 2018;1–22.

S. Leon, J. Perello, D. Careglio, E. Grasa, M. Tarzan, **"End-user Traffic Policing for QoS Assurance in Polyservice RINA Networks"**. Springer Telecommunication Systems. April 2018;1-13

Ruiz, R. J. Duran, I. de Miguel, P. S. Khodashenas, J. J. Pedreno-Manresa, N. Merayo, J. C. Aguado, P. Pavon-Marino, S. Siddiqui, P. Fernandez, R. M. Lorenzo, and E. J. Abril, **"A Genetic Algorithm for VNF Provisioning in NFV-enabled Cloud/MEC RAN architectures"**. Appl. Sci. December 2018, 8(12), 2614

Book chapters

K. Liolis, A. Geurtz, R. Sperber, D. Schulz, S. Watts, G. Poziopoulou, B. Evans, N. Wang, O. Vidal, B. Tiomela Jou, M. Fitch, S. Sendra Diaz, P. Sayyad Khodashenas, N. Chuberre, **"Satellite Use Cases and Scenarios for 5G eMBB"**. Chapter 2 of Satellite Communications in the 5G era, pp 25-60, IET, 2018.

J. Llobera, I. Fraile, J. A. Núñez, S. Malewski, X. Artigas, S. Fernandez, **"Multi-device content based on video. A practical toolset for creation and delivery"**. Chapter 7 of Applications and Usability of Interactive TV, pp 93-104, Springer, 2018.

A. Tzanakaki, M. Anastasopoulos, N. Gomes, P. Assimakopoulos, J. M. Fàbrega, M. Svaluto Moreolo, L. Nadal, J. Gutiérrez, V. Sark, E. Grass, D. Camps-Mur, A. de la Oliva, N. Molner, X. Costa Perez, J. Mangues, A. Yaver, P. Flegkas, N. Makris, T. Korakis and D. Simeonidou, **"Transport Network Architecture"**. Chapter 7 of 5G System Design: Architectural and Functional Considerations and Long Term Research, pp 151-178, Wiley, 2018.

5G/IoT: Software Networks

Enabling secure 5G infrastructure management and services via open networking from the data-center to the edge.

Main partners

The digitalization era requires an intelligent Internet based on new architectures and services, able to interconnect people, objects and environments in more efficient and dynamic ways.

New systems and protocols are also needed to transform information into new knowledge by creating intelligent environments. Users shall be empowered to design, reconfigure and manage the network based in their own interests and needs.

The Software Networks (SN) research area of i2CAT focusses on:

- Exploring and defining new ways to provision and manage the **Internet networks of the future**.
- Enabling new functionalities and business models by means of **integrating technologies** such as networked Clouds, Software Defined Networking (SDN) and Network Function Virtualization.

Research challenges

5G Network Architectures
5G technologies represent the next generation of communication standards able to provide ultra-high connection speeds, increased coverage, spectral efficiency, very low latency and to allow connectivity among billions of devices. This line aims to investigate novel SDN/NFV based networking solutions to provide 5G services in a versatile, fast and efficient way.

Technologies
Software Defined Networking (SDN), Network Function Virtualization (NFV), Recursive Internet Architectures, Network as a Service (NaaS)

Applications
Neutral Hosting, Multi-tenancy in Open Access Networks, Virtual network security, Dynamic network overlays, Mobility and multi-homing

Cloud Technologies
Cloud technologies are one of the main drivers of digital transformation, enabling distributed computing and storage with secure and robust connectivity. SN is actively innovating in cloud technologies by bringing automation to cloud and network services, while lowering the transformation barrier for SMEs and more traditional industries.

Technologies
Cloud computing, Fog/Edge computing Infrastructure as a Service (IaaS), OpenStack, Dockers and Micro-services

Applications
Cloud networking, Hybrid clouds, Deployment of complex cloud applications, Data integration and slicing, Edge services/Edge analytics

Relevant projects

5G City. H2020 coordinated project. It aims at building and deploying a common, multi-tenant, distributed radio & cloud platform for municipalities and infrastructure owners acting as 5G neutral hosts with demonstrations in three different cities (Barcelona, Bristol and Lucca).

Caramel. H2020 coordinated project. Its goal is to proactively address modern vehicle cybersecurity challenges applying advanced Artificial Intelligence (AI) and Machine Learning (ML) techniques, while continuously seeking methods to mitigate associated safety risks.

SAT5G implements solutions to enable the "plug and play" integration of sitcom components into 5G networks.

5GESSENCE introduces innovations in softwarization, virtualization and cognitive management to provide a highly flexible and scalable platform capable of supporting new business models.
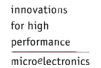
5G/IoT: Mobile Wireless Internet

Innovating at the crossroads between 5G and IoT on radio protocols and infrastructures. The Mobile Wireless Internet Area (MWI) work spans from the physical design of embedded systems to driver-level optimizations of broadband wireless technologies based on IEEE 802.11, software defined networking and development of V2X applications. Among the main market sectors impacted by MWI we find: Smart Cities, Smart Buildings, Smart Factories and Mobile Networks.

Its main areas of expertise include:
• **Wireless technologies** for constrained devices, e.g. WSNs and LPWANs
• Application of wireless technologies to **indoor positioning**
• **High capacity wireless networks** based on IEEE 802.11 and 3GPP
• **V2X communications**

Main partners

University of BRISTOL

SEAT

SIMON

ihp
innovations for high performance microelectronics

Ajuntament de Barcelona

AASA

Blu Wireless

betevé

ALSTOM

Continental

Accelleran

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH
UPC

sensefields
Sensors meet traffic

UNIVERSITY OF SURREY

Research challenges

Internet of Thing (IoT)

The goal of the IoT research line is to integrate Internet capabilities into devices constrained in terms of energy, computing, storage and communications in order to provide connectivity for the next billion devices.

Technologies

Radio wake-up Systems, 6LowPAN, CoAP, ZigBee, Z-Wave, BLE, RFID, Ultra Wide Band (UWB), BT mesh, LP-WAN (LoRa, NB-IoT, SIGFOX, NB-IoT), Optical Camera Communications, Visible Light Positioning

Applications

Smart Cities (smart lighting, smart mobility, smart energy), Industry 4.0 (logistics, positioning), Automation for homes and smart buildings, Mobile Payment systems

Software Defined Wireless Networks (SDWN)

The goal of this research line is to design algorithms and protocols that lay the foundations of 5G networks, providing the wireless capacity required to cope with the forecasted increase on mobile connectivity demand. The group focuses on experimental improvements of systems based on IEEE 802.11 radios and SDN technology.

Technologies

IEEE 802.11 (Sub6 and mm-wave) LTE (based on OpenAirInterface) SDN (openvswitch, OpenDayLight, NETCONF), Linuxwireless stack Bare Metal Wi-Fi, Optical Camera Communications, Visible Light

Applications

Wireless backhauling supporting e.g. Small Cells, surveillance, Neutral Small Cell operators, High density venues (e.g. stadium, concert), Smart City Wi-Fi, Mobile Payment systems

Vehicular communications (V2X)

The goal of this research line is to design algorithms and applications to enable the future connected and autonomous cars. The group expertise lies in the wireless technologies powering V2X, namely 802.11p and C-V2X, combined with practical knowledge of the facilities offered by the ETSI-G5 stack.

Technologies

IEEE 802.11p, LTE Release 14 C-V2X, ETSI-G5Cohda MK5, Outdoor localization with lane precision, OMNET/SUMO simulators

Applications

Safety services including position awareness and interaction with traffic lights. Smart road infrastructure to support vulnerable road users (pedestrians, bikes).

Relevant projects

Conclusion of the H2020 5G-XHAUL project, which was technically coordinated by the MWI group. In 5G-XHAUL, MWI demonstrated, in a city-wide testbed, a novel SDN control plane for wireless backhauling controlling Sub6 and mmWave devices.

Continental. Design of a novel wireless system to track the movement of printing molds inside a warehouse. The solution combines passive RFID tags installed on the molds with an active tracking system based on UWB technology.

V2X ALSTOM. Deployment of a novel signaling system between autonomous vehicles and city infrastructure built on top of ETSI-G5 and DSRC technologies.

Relevant achievements

Wireless Software Defined Network. Deployment of MWI's wireless SDN technology in Barcelona (Pere IV Street) within the framework of the H2020 FLAME project.

Visible Light Communications. Through a partnership with AASA, the patented VLC technology for positioning and communication developed by MWI, was demonstrated at CES 2018 Las Vegas, at the National Instruments Week in Austin, at the Hannover Messe and at the Light and Building Expo in Frankfurt.

IPR support. Based on their well-recognized knowledge of wireless technologies, the MWI team has been selected by XIAOMI to provide support in a litigation case involving power control algorithms in cellular systems.

5G/IoT: Recursive InterNetwork Architecture (RINA)

Main partners

Transforming networking to deliver future-proof technologies. RINA is an effort to simplify the network protocol stack, minimizing network complexity and solving the fundamental issues of the "TCP/IP protocol suite".

The RINA Area explores:

- The potential of RINA-based technologies, documenting the benefits of its adoption in different networking environments: data-center (DC), multi-access service providers, core networks and overlays.
- Ways to educate potential stakeholders and engage key players in RINA research and development activities to mature the technology and its associated specifications, so that RINA can be deployed in production networks.
- The contribution to standard bodies such as ETSI and the ISO. i2CAT is an active participant at ISO SC6 WG7 and ETSI ISG NGP, where the RINA specifications and RINA principles (respectively) are an important part of both groups work.

Research challenges

RINA implementations
The research group works to develop programmable RINA implementations in order to experience with and produce Proofs of Concept. Such implementations not only allow the practical verification of RINA's theoretical benefits, but can also be the basis of future RINA- based products.

Technologies
Linux, C, C++, KVM, WiFi, Ethernet

Applications
RINA overlays, RINA in the core, RINA for Distributed Mobility Management and Open Multi-Access Edge Computing, RINA as a transport solutions for IP and Ethernet flows and VPNs

RINA specifications and network design
Maintenance and evolution of core RINA specifications, maturing them to the level of enabling interoperable, production-grade implementations.

Policy design for a variety of network environments, to demonstrate the flexibility of RINA and establish that its architectural principles can be applied to any type of network.

Technologies
IRATI RINA implementations

Applications
Data Centers, Service provider nets, App-specific overlays

Relevant projects

The leitmotiv of **ARCFIRE**, an h2020 project, is to experimentally demonstrate the key benefits of RINA at large scale, leveraging former EC investments in Future Internet testbeds (FIRE+) and in the development of the basic RINA technology (IRATI, PRISTINE). ARCFIRE, technically lead by i2CAT, delivered the following results:
- Experimental evidence of RINA benefits for mobility, multi-homing, Quality of Service, resiliency and network management; carrying out deployments over more than 60 physical nodes, using thousands of concurrent flows, multiple layers and tenants.
- Enhanced IRATI RINA implementation, with: i) support for Distributed Mobility Management over WiFi; ii) per-class QoS addressing latency and packet loss; iii) dynamic and seamless network renumbering and iv) IP over RINA.
- Development of Rumba, an open source orchestrator to automate the deployment, configuration, execution and monitoring of RINA experiments on multiple testbeds.work.

Relevant achievements

PoC of RINA as an E2E network slicing solution demonstrated at the TIP Summit. The IRATI open source software was leveraged by Ciena, BT, i2CAT and the TSSG to demonstrate a multi- operator virtual network use case at the Telecom Infra Project Summit.

Publication of a Group Report at ETSI ISG on Next Generation Protocols (NGP). i2CAT is the editor of ETSI GR NGP 009, which describes the principles of RINA as a foundation to design and build simpler, more performing and secure networks.

Organization of the 5th international RINA Workshop at Barcelona. The two day event hosted by i2CAT attracted 50 researchers and innovators from industry and academia to discuss future RINA developments.

Media Internet

Researching on the crossroad of immersion and interaction
The Media Internet Area (MIA) explores new immersive and interactive experiences and develops the systems that enable the Internet distribution and consumption of such experiences. Its research activities bring forward the newest formats and experiences, focusing on how to capture, produce, distribute and render them. Its main research areas are: Distributed and Interactive Systems, Human Computer Interaction and Immersive Media Formats

Distributed and Interactive Systems (DIS)
Technological aspects and solutions to next-generation distributed systems over heterogeneous environments, while guaranteeing high-performance, scalability, ubiquity, adaptability and synchronization, among other relevant challenges.

Immersive and Interactive Media (IIM)
Novel capturing, production, encoding, rendering Technologies and Formats (360º video, point cloud, 3D, object- & scene-based audio, light fields, etc.).

Human & Computer Interaction (HCI)
Analyzing how humans interact with the technology, the contents and other users using the technology in order to maximize accessibility, social integration, comfortability, comprehension and usability. Likewise, the area is interested in exploring the best evaluation metrics and methodologies to determine the benefits in these research fields.

Main partners

Research challenges

Networked Media
The main goal of this research line is to study and develop efficient software systems to manipulate digital media over the network by using and aggregating industry standards. MIA implements core services which are easy to orchestrate and appropriated for a cloud-based virtualized environment, where scalability and orchestration are major requirements.

Technologies
Network Protocols
Adaptive Delivery
Hybrid Broadcast Broadband
Content Delivery Networks
Clock Synchronization
Advanced Encoding
Metadata Models
Cloud Computing
Virtualization & SDN

Applications
Connected TV Services
Ultra-HD media delivery
Low-latency video communication
Cloud operations (transcoding, mixing)
Content Delivery Networks
Immersive & Interactive Media

Immersive & Interactive Media
This research line works towards the creation of new content formats and experiences for mobile devices and head-mounted displays.

The purpose is to offer new and richer immersive and interactive content experiences and the tools to create them.

Technologies
Omnidirectional Media
Spatial / Depth-based Media
Object-based Media
Eye Tracking
Lightfields
Field of View (FoV)-based delivery
Virtual Reality
Augmented Reality
Mixed Reality

Applications
Novel content formats
Multiplatform content (HMD, TV, tablet, mobile)
Cultural heritage
e-Learning

Relevant projects

VR-Together, coordinated, H2020. The goal of this project is to offer ground-breaking, truly social VR experiences based on photorealistic immersive content between users located in remote domestic scenarios and in a cost-effective manner.

ImmersiaTV, coordinated, H2020. This project targets existing challenges and works to enable coherent and customizable immersive multi-screen TV experiences.

ImAc, coordinated, H2020. ImAc explores how accessibility services (including subtitling, sign language interpreting and audio description) can be efficiently integrated with immersive media.

Relevant achievements

Conclusion of ImmersiaTV project, which has created an end-to-end toolset for the conception and distribution of multiscreen immersive content experiences, providing end-users with a coherent multi-device audiovisual experience.

i2CAT will host **ACM TVX 2020,** a leading international conference on TV and online interactive video experiences. The manager and a senior researcher of MIA will serve as General Chairs.

MIA was granted the MedGaims project, which aims at revolutionizing the tourist experience by gamifying sites with physical and virtual applications, thus boosting the interest of visitors.

10 publications in relevant conferences, books and presentations in workshops.

+15 live demonstrations pursued at leading scientific and industry events such as IBC Show and NAB Las Vegas.

Distributed Artificial Intelligence

Fostering the application of Artificial Intelligence technologies to create intelligent connectivity services and solutions

The Distributed Artificial Intelligence Area is focused on fostering the application of Big Data and Artificial Intelligence technologies in use-cases relating to:

- 5G networks
- IoT
- Cybersecurity
- Internet media contents

Main partners
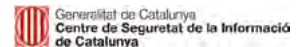
Research Challenges

AI as a new tool to operate 5G networks. Configuration, management and operation of 5G networks are becoming extremely difficult processes. Through the Machine Learning it can be obtained a set of outputs that will adjust the 5G network dynamically.

AI to tackle IoT Big Data. AI detects patterns from the IoT data and learns how to adjust the behavior of IoT services and to improve the quality of IoT datasets through Machine Learning techniques.

Leveraging the potential of AI in securing the networks. By using different algorithms to parse and analyze data, Machine Learning empowers AI to detect patterns for the prevention of threats within the cybersecurity environment.

Technologies
SPARK
HADOOP
ElasticSearch
TPU (Tensor Processing Unit)
Predictive Analytics
Deep Learning
Machine Learning

Applications
Heterogeneous data integration
ETL processes
Central open data repository
Tailored and secure access to shared data resources
Data preparation
Synthetic sensors
Platform as a Service

Relevant projects

Symphony is an open and secure platform for data sharing that, through Data Slicing allows the integration and preparation of datasets. It is mainly addressed to public entities for the secure sharing of data in an open environment by leveraging the existing knowledge in ingestion, pre-processing and processing of data.

MUV – Mobility Urban Values – is an H2020 Research and Innovation Action. It raises citizen awareness on the quality of the urban environments in which they live while promoting a shift towards more sustainable and healthy mobility choices. It results from the combination of behavioral change techniques, new technologies, data science and co-design approaches.

Shield. This H2020 project proposes a universal solution to dynamically establish and deploy virtual security infrastructures into ISP and corporate networks. SHIELD builds on the huge momentum of Network Functions Virtualization (NFV) effectively monitoring and filtering network traffic in a distributed manner.

ALSTOM The ALSTOM solution applies AI to images taken by thermal cameras in order to detect stopped objects in crossing paths, as well as employing Reinforcement Learning in conventional cameras and local processing images. This approach is immune to climatological conditions and offers privacy.

Relevant achievements

Using Neural Networks for anomaly detection in Cybersecurity. Neural Networks have been traditionally applied to image and speech recognition. However, they are useful in any context where big amounts of heterogeneous data need to be treated.

Using Machine Learning algorithms for calibration and outlier detection of environmental sensors. i2CAT works with unsupervised techniques in order to improve the quality of the sensor data and with supervised ones to improve the precision of a group of environmental sensors.
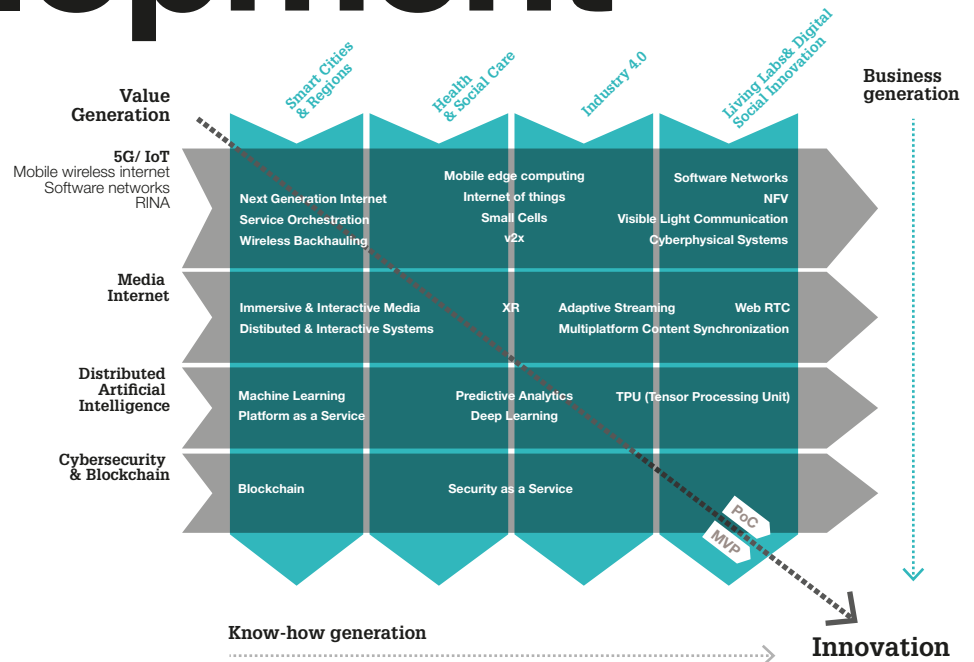
Usage of AI at the edge. i2CAT is working on the implementation of AI solutions, such as those based on neural networks for small, low power consumption and affordable devices using Google's TPU (Tensor Processing Unit) and neural network stick from Intel and Google.

Participation in the Catalonia AI strategy Committee. i2CAT contributes to the strategy that the Government of Catalonia is working on to foster the AI sector locally.

Innovation Business Development

Innovation to drive ICT research towards market and society needs

The Innovation Business Units (IBUs) aim is to boost the collaborations within the innovation ecosystem. They also work to increase the social and business impact of the research capabilities and the knowledge generated by i2CAT. Focused on verticals, the Innovation Business Units leverage their knowledge of the market companies, needs, relevant players, users) in order to figure out innovative solutions based on the expertise and technologies developed by i2CAT research areas.

Value Generation

Smart Cities & Regions   Health & Social Care   Industry 4.0   Living Labs & Digital Social Innovation

Business generation

5G/ IoT
Mobile wireless internet
Software networks
RINA

Next Generation Internet
Service Orchestration
Wireless Backhauling

Mobile edge computing
Internet of things
Small Cells
v2x

Software Networks
NFV
Visible Light Communication
Cyberphysical Systems

Media Internet

Immersive & Interactive Media
Distibuted & Interactive Systems

XR

Adaptive Streaming
Multiplatform Content Synchronization

Web RTC

Distributed Artificial Intelligence

Machine Learning
Platform as a Service

Predictive Analytics
Deep Learning

TPU (Tensor Processing Unit)

Cybersecurity & Blockchain

Blockchain

Security as a Service

PoC
MVP

Know-how generation

Innovation

The i2CAT Innovation Business Units are focused on the following fields:

Smart Cities & Regions

Smart City Platforms, IoT, Big Data
Mobility: Smart Infrastructures for Connected Cars
Sustainability: Energy Efficiency
Intelligent Transport Systems
Public Services: Interoperability, Reliability, Resiliency

Industry 4.0

Industry digitization: industrial Internet; logistics 4.0; Virtual Reality
Smart Manufacturing: Artificial Intelligence, Advanced Robotics
Industrial Platforms: IoT, Cloud services; Big Data, HPC

Health & Social Care

Patient Empowerment
Social Inclusion
Active Ageing
Future Health Systems

Living Labs& Digital social innovation

Social Innovation
Open Innovation
Systemic Innovation
Citizen Laboratories

The main activities of the Innovation Business Units, always in collaboration with the research, software engineering and support areas, are the following:

Co-development

Fostering strategic alliances to create innovative market-oriented technologies and solutions addressed to the different verticals

Technology roll-out and validation

Coordinating the design and deployment of trials for technological and functional validation purposes with local partners, public administrations and users

Technology and knowledge transfer

Setting up IPR exploitation agreements, creating mixed R&D teams with companies, and boosting and supporting the creation of start-ups

Private-Public initiatives

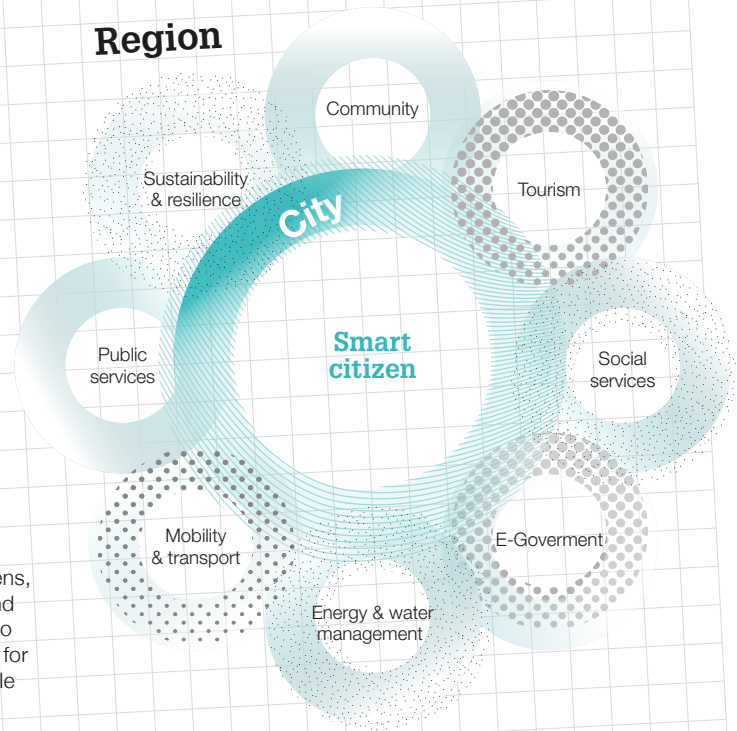Driving strategic projects & alliances

Smart Cities & Regions

Innovation to drive ICT research towards digital transformation of cities and citizens.

Through the Smart Cities & Regions Unit the center helps local and regional governments to define and implement Smart City strategies based on i2CAT's know-how to guarantee a high quality of life for citizens as well as a sustainable future for the planet.

The latest technological advances on IoT, Big Data or connected and autonomous cars are the basis for a smarter mobility, energy and public services, as well as for the empowerment of citizens.

Governments, as well as citizens, must commit to an efficient and responsible use of resources to guarantee a high quality of life for citizens as well as a sustainable future for the planet.

Smart cities and regions transform public and social services, improving the interaction with citizens and preserving the environment.

Region

City

Smart citizen

Community

Sustainability & resilience

Tourism

Public services

Social services

Mobility & transport

E-Goverment

Energy & water management

Remarkable projects

More relevant initiatives

5G Connected Car
This project tries to demonstrate the potential of 5G and C-V2X.. I2CAT was focused in a safety case based on the notification to the vehicle dashboard of the presence of a bicycle in the vicinity. In this case an On Board Unit (OBU) was developed for the bicycle equipped with low latency V2X messaging and real-time high-precision geolocation. To obtain the location with centimetric precision, three data sources were merged, a commercial GPS, inertial sensors and Ultra Wide Band (UWB).

AERIAL UPTAKE
Aerial Uptake brings together local and regional public authorities and key players of the Unmanned Aerial System (UAS) sector from 6 European regions, being pioneers in the creation of a single European drone market. They exchange and transfer knowledge to unleash the potentials of UAS technology for civil and commercial usages.

IoT Catalan Alliance
IoT Catalan Alliance is an initiative promoted by the Government of Catalonia under the SmartCatalonia strategy to accelerate the adoption of IoT technologies. It brings the majority of IoT players within the Catalan ecosystem together to raise awareness of this technology. In 2018, the initiative has explored the opportunities that IoT solutions offer to Health and Logistics, working closely with the main innovative stakeholders in these fields through workshops and participation in conferences.

SmartCatalonia Laboratori
It is an initiative of the SmartCAT strategy that launches pilot tests of innovative solutions to solve technological challenges identified by Catalan municipalities. In 2018, 6 cities have implemented smart solutions, including Barberà del Vallès, whose mobility pilot with BusUp has been since implemented in 7 Catalan cities.

SmartCatalonia Challenge
SmartCAT Challenge is an initiative of the SmartCAT strategy that promotes entrepreneurship by providing solutions to challenges presented by municipalities or the non-profit sector to improve the quality of life of citizens. In 2018, SmartCatalonia Challenge has received 30 innovative solutions, and awarded 6 prizes for best technological solution in the sectors of environmental policies, citizen security, social services and commerce. One of these, a geolocation and crime analysis solution, has been tested in a real environment in the city of Sabadell.

V2x
Collaboration with diferent stakeholders to deploy new services using V2X technologies.

LoRa Granollers Project
The LoRa Granollers Project is a feasibility study to deploy and implement a LoRa network in Granollers in order to improve the city's urban services management. It has addressed the urban management and an educational platform in the field of IoT.

Main partners

Generalitat de Catalunya — Government of Catalonia · Ajuntament de Barcelona · SEAT · Telefónica · vodafone · orange · cellnex driving telecom connectivity · SmartCatalonia · NOKIA · Ajuntament de Granollers · ALSTOM · SIMON
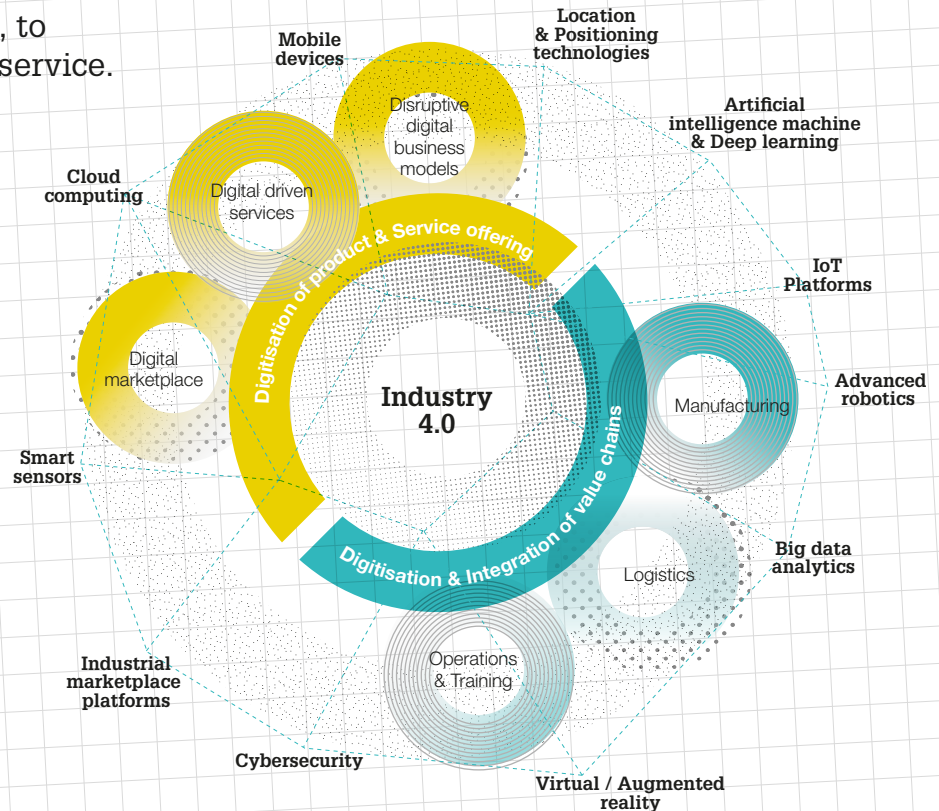
Industry 4.0

Industry 4.0 will transform the entire industrial ecosystem, from product development and purchasing, to manufacturing, logistics and service.

i2CAT's Industry 4.0 Innovation Business Unit aims at collaborating with companies in the development and deployment of digital technologies in order to collect, integrate and analyze data about operational processes.

The digitization of products is also essential. Adding smart sensors and data analytics tools to generate data on product use and refine products is key to meet the increasing needs of end-customers.

The Industry 4.0 business unit also helps in the expansion of companies offering disruptive digital solutions like data-driven services and integrated platform solutions

i2CAT is focused on the following Industry 4.0 framework:

Mobile devices

Location & Positioning technologies

Artificial intelligence machine & Deep learning

Cloud computing

Disruptive digital business models

Digital driven services

IoT Platforms

Digitisation of Product & Service offering

Industry 4.0

Manufacturing

Advanced robotics

Digital marketplace

Digitisation & Integration of value chains

Smart sensors

Big data analytics

Logistics

Industrial marketplace platforms

Operations & Training

Cybersecurity

Virtual / Augmented reality

Remarkable projects

More relevant initiatives

SMARTY Project (Smart SMEs for Industry 4.0)
H2020 project. Partners from regions across Europe have decided to join forces to exchange experience on how policies related to Structural Funds can unlock the full potential of Industry 4.0, fully convinced that the success of digital transformation will greatly depend on the SMEs, which feel in need of more practical support. SMEs4I4.0 project is born to establish a common basis for policy learning among its members to overcome fragmentation of Industry 4.0 solutions and their enabling potential by dealing with main challenges hampering their diffusion into the European Union ecosystem.

Boost 4.0. This H2020 project isis the biggest European initiative of Big Data applied to Industry 4.0. With 50 partners and a 20M€ budget, Boost 4.0 will lead the construction of the European Industrial Data Space that will improve the competitiveness of Industry 4.0 and will foster the Big Data technology introduction in the factories. This will provide the industrial sector with the necessary tools to obtain the maximum benefit of Big Data. Ten pilots will be deployed in several factories, one of them will be developed with the collaboration of i2CAT in Gestamp Spain, the multinational automotive company.

Continental. i2CAT has developed a technological solution that allows to automatically position moulds in an efficient way and with a minimal cost. The proposed solution is based on metal-RFID and UWB (Ultra Wide Band) technology. The identification and localization of injection moulds in the manufacturing plant of Continental is a critical part of production planning and optimization

ScaleUp. H2020 project. It is a market-driven action which aims at identifying a portfolio of a minimum 200 high potential start-ups through the 4 connected hubs and to help them scale-up and to become leaders in the emergent Internet of Things (IoT) Applications markets.

Foundry 4.0
This project analysed and defined the ideal model of a 4.0 factory in the foundry industry, applying the last trendy technologies and innovations related with the Industry 4.0 and digitalization: Industrial IoT and Open Big Data architectures.
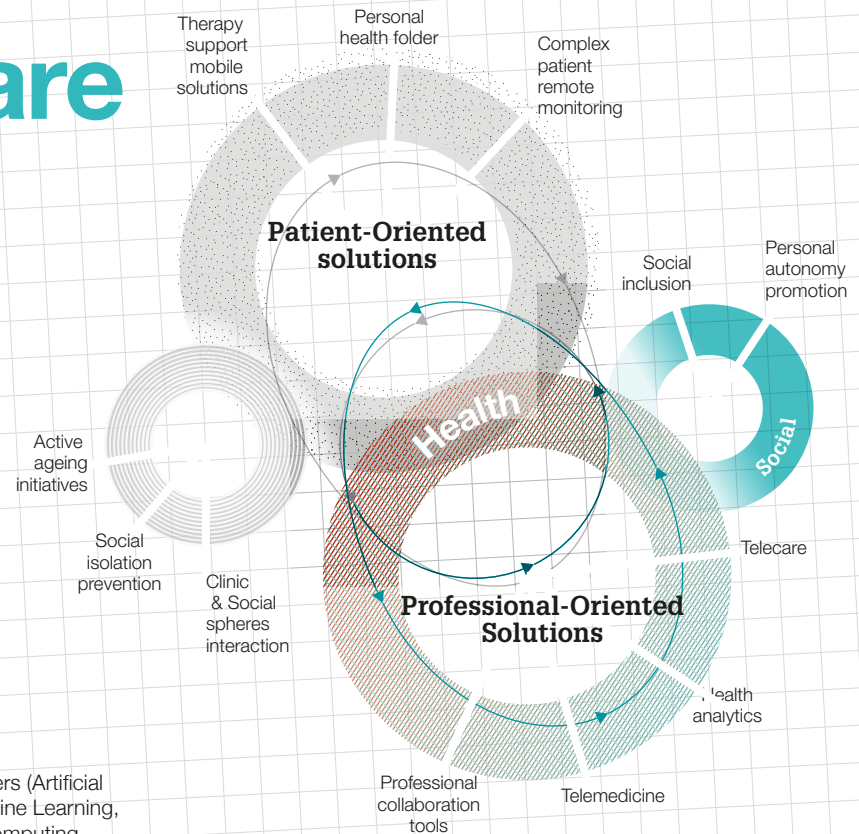
Main partners

Health & Social Care

Internet is helping users play a more active role in their own health and social environment. This Health & Social Care Unit works not only to provide technology to the professional side of the health and social care fields, but also to empower the citizen by intensifying technology use on their own behalf.

i2CAT helps citizens by creating sustainable communication channels with professionals, and assist professionals by rethinking assistance towards proactivity through the capabilities that technology offers (Artificial Intelligence & Machine Learning, Blockchain, Fog Computing, Internet of Things, Event Driven Architectures, Big Data & Analytics).

Therapy support mobile solutions

Personal health folder

Complex patient remote monitoring

Patient-Oriented solutions

Social inclusion

Personal autonomy promotion

Active ageing initiatives

Social isolation prevention

Clinic & Social spheres interaction

Health

Social

Telecare

Professional-Oriented Solutions

Health analytics

Professional collaboration tools

Telemedicine

Remarkable projects

Acadom

Acadom ensures the success of speech rehabilitation therapies at the patient's home through telemedicine. Intelligent systems suggest therapy steps and adapt to the patient's evolution through voice recognition systems.

HL4.0

This project aims at identifying and collecting all healthcare data generated both inside and outside of the hospital, profiting from technologies like Big Data and analytic systems to establish new ways of providing services. It involves clinical data, genòmic information, biomedical images and other hospital systems or information generated by patients themselves in online communities.

More relevant initiatives

Vincles BCN

i2CAT is collaborating with the Social Rights Area of the Barcelona City Council in the development of the Vincles BCN programme, an initiative to help the the elderly lead more active and sociable lives. The programme aims to bridge the digital divide, which particularly affects the elderly, as well as improving the quality of life by using new digital technologies as a means of communication with people's local environment.

Remote Health Services Platform

Remote Health Services platform is a reliable and accessible Health care system developed to provide remote access to professional Health services from any place and at any time. This project is a collaboration between everis and the i2CAT Foundation.

5G Connected Ambulance

is equipped with advanced multi-technology and communication services which uses a 5G network and dedicated communication to receive specialised remote support in real time via high-definition video while caring for a patient inside an ambulance. In the near future, it will be able to connect the health and medical emergency unit with other vehicles (V2V) or infrastructures (V2i) in order to get through traffic and reach the hospital more quickly. t will deploy an ad hoc network in the environment of the connected ambulance. Through radio slicing, it will be possible to control in a flexible and agile way the allocation of network resources among the different services offered according to the needs of each moment. This live demonstration was developed as part of 5G Barcelona activities in collaboration with: SEM, Vodafone, and the government of Catalonia.

Blockchain & Health

Development of a proof of concept with Blockchain technology to allow citizens to manage and authorize third-party access to their health data (data donation).

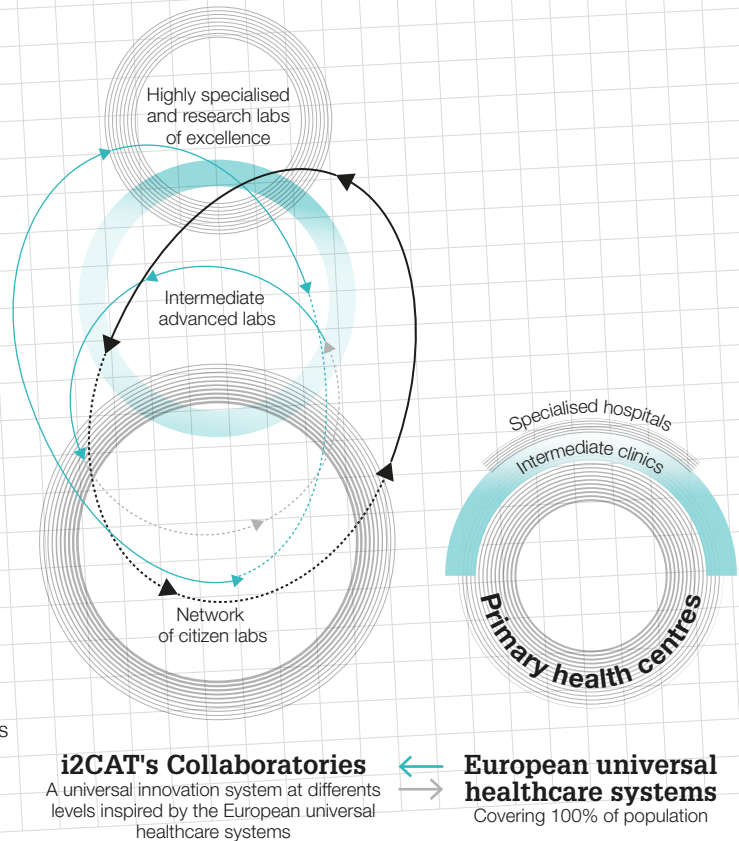## Main partners

Living Labs & Digital Social Innovation

The Living Labs & Digital Social Innovation (DSI) area is in charge of i2CAT's definition of the Quadruple Helix model and strategy, promoting the Living Lab approach across the R&D areas of the organization, as well as designing, testing and evaluating new living labs in Catalonia.

The group is generating its own research projects around the vision of co-laboratories as universal innovation ecosystems, based in networks of open research and open innovation labs.

Digital social innovation is the path to make technology work for the citizen and solve the problems and issues we face as a society.

The area is generating its own research projects around the vision of co-laboratories as universal innovation ecosystems, based in networks of open research and open innovation labs.

Highly specialised and research labs of excellence

Intermediate advanced labs

Network of citizen labs

Specialised hospitals

Intermediate clinics

Primary health centres

i2CAT's Collaboratories
A universal innovation system at differents levels inspired by the European universal healthcare systems

European universal healthcare systems
Covering 100% of population

Remarkable projects

Laboratori de Ciutadania Digital (LCD)

The center leads this initiative devoted to build a first digital policy laboratory open to collaboration among the citizenship and their governments (Digital Policy Lab). The LCD research and innovation program it is centered on citizen digital sovereignty, the digital rights and duties that derive from it, the new forms of digital democratic action, and the civic technologies that they entail. That is to say in the new digital policies that help to shape the new digital society. The LCD is a collaborative structure between the Administration and the citizens to help defining policies in favour of an advanced digital society.

More relevant initiatives

Mobility Urban Values (MUV)

MUV is an H2020 project dedicated to building testbeds that will change the mobility model in 6 European cities (Barcelona, Helsinki, Amsterdam, Fundão, Palermo and Ghent) through a mobile app and a network of air monitoring stations, bringing citizens, local authorities and commercial shops together for more sustainable cities.

Catlabs Network

The Catlabs program has created a state-of-the-art open labs moviment in Catalonia, gathering the interest of more than 70 institutions around the territory. The Catlabs network congregates the main open labs in the region (living labs, fab labs, biblio labs, innovation labs, etc.) with the goal of promoting digital social innovation. This initiative complements the different programs of RIS3CAT.

European School of Social Innovation Network.

i2CAT has been accepted in the European School of Social Innovation, the main academic organization promoting research and innovation in this new field. The fundamental societal changes of our time require the inclusion of social innovations in a paradigm shift of the innovation system. The European School of Social Innovation was formed to assist and enhance this holistic concept of innovation.

First book on techno-anthropology. The collaboration between i2CAT, Colegio de la Frontera Norte in Mexico and a group of international researchers has resulted in the publication of one of the first books in techno-anthropology, a new discipline merging cultural anthropology, design and digital technology contributing to the understanding and design of digital cultures and societies.

Main partners

Knowledge & Technology Marketing

i2CAT works to boost collaborations with the companies and the innovation ecosystem players and so to increase the social and business impact of its research capabilities and knowledge through:

- **Strategic alliances** to create innovative market-oriented technologies and solutions.
- Coordinating the **design and deployment of trials** for technological and functional validation purposes with local partners, public administration and users.
- Setting up IPR **exploitation agreements**, creating mixed R&D teams with **companies** and boosting and supporting the creation of start-ups.

Remarkable assets

The center has been focused on the following assets to be exploited in the market:
- High-precision indoor location based on Visible Light Communications
- SDN-enabled enterprise WiFi solution
- Immersive media end-to-end toolchain
- 5G Neutral Hosting Platform
- Terrestrial Satellite Resource Coordinator (TALENT)
- Secure data sharing platform (Symphony)
- Open source programmable RINA implementation, (IRATI)

More detail at:
https://www.i2cat.net/asset-portfolio/

High precision positioning solution
The i2CAT VLP is a high precision indoor positioning solution based on visible light communications (VLC). Current commercial indoor positioning systems use other technologies such as WiFi, Bluetooth and UWB but with an accuracy in the range of meters that for many use cases is not suitable. VLP is able to obtain real-time 3D positioning with an accuracy of less than 10cm. Moreover, it is ideal for radiation sensitive environments.

i2CAT's VLP technology can provide Location Based Services (LBS) in a wide range of sectors such as retail, mobility, entertainment, logistics, healthcare, targeted advertisement, tourism.

Symphony - A secure data sharing platform
Symphony is an open and secure platform for data sharing that allows the integration of datasets and its preparation. The platform is mainly addressed to public entities for the secure sharing of data in an open environment by leveraging the existing knowledge in data ingestion, data pre-processing and data processing. In a secure and unified way, Symphony allows data sharing among different actors using a technique named Data Slicing. Data Slicing allows the creation of virtual data sets specifics for each user.

i2Track - High precision location solution based on UWB and RFID
i2Track is an indoor tracking and location system based on Ultra Wide Band (UWB) and RFID tagging technologies. UWB allows to locate items with a precision of about 20 cm and overcomes most of the limitations of alternative solutions such as the ones based on WiFi or Bluetooth in industrial or logistic environments. Thanks to a new UWB module and its reduced size, weight and power, the design,

pilot and implementation phases can be accelerated, delivering a new approach to UWB positioning projects allowing a vast range of industrial applications.

Remarkable achievements

In 2018 i2CAT has led the application of the Emerging Technologies Community in the field of Internet of Things, FEM IoT. It is a cluster of research and innovation centers specialized in the next challenges of the IoT, such as: consumption, density, speed. This group has proposed two projects that value the research assets of the participants, with a budget of more than 4 million euros. This initiative reinforces the relationship of i2CAT with the Technology supply sector stakeholders and the future implementation of the Digital Innovation Hub in IoT, which will gather all the Technology demand in this sector.

It has collaborated as an innovation lab with the Centre for Information Security of Catalonia (CESICAT) and the Centre for Telecommunication and Information Technologies (CTTI) of the Government of Catalonia fostering innovation within the public administration.

5G connected car. A 5G mobile network improves communication between the car with road infrastructure and other vehicles by sending alerts to the car in the event of danger, obstacles or changing conditions. The 5G Connected Car project pilot combines the benefits of 5G like low latency and edge computing in these fields: road security and infotainment. 5G Connected car allows to alert the driver in 3 different use cases when the vehicle is in a blind right-hand corner: pedestrian, bicycle and obstacle detection. This pilot was shown in the streets surrounding the Mobile World Congress Barcelona during the days of this reference event.
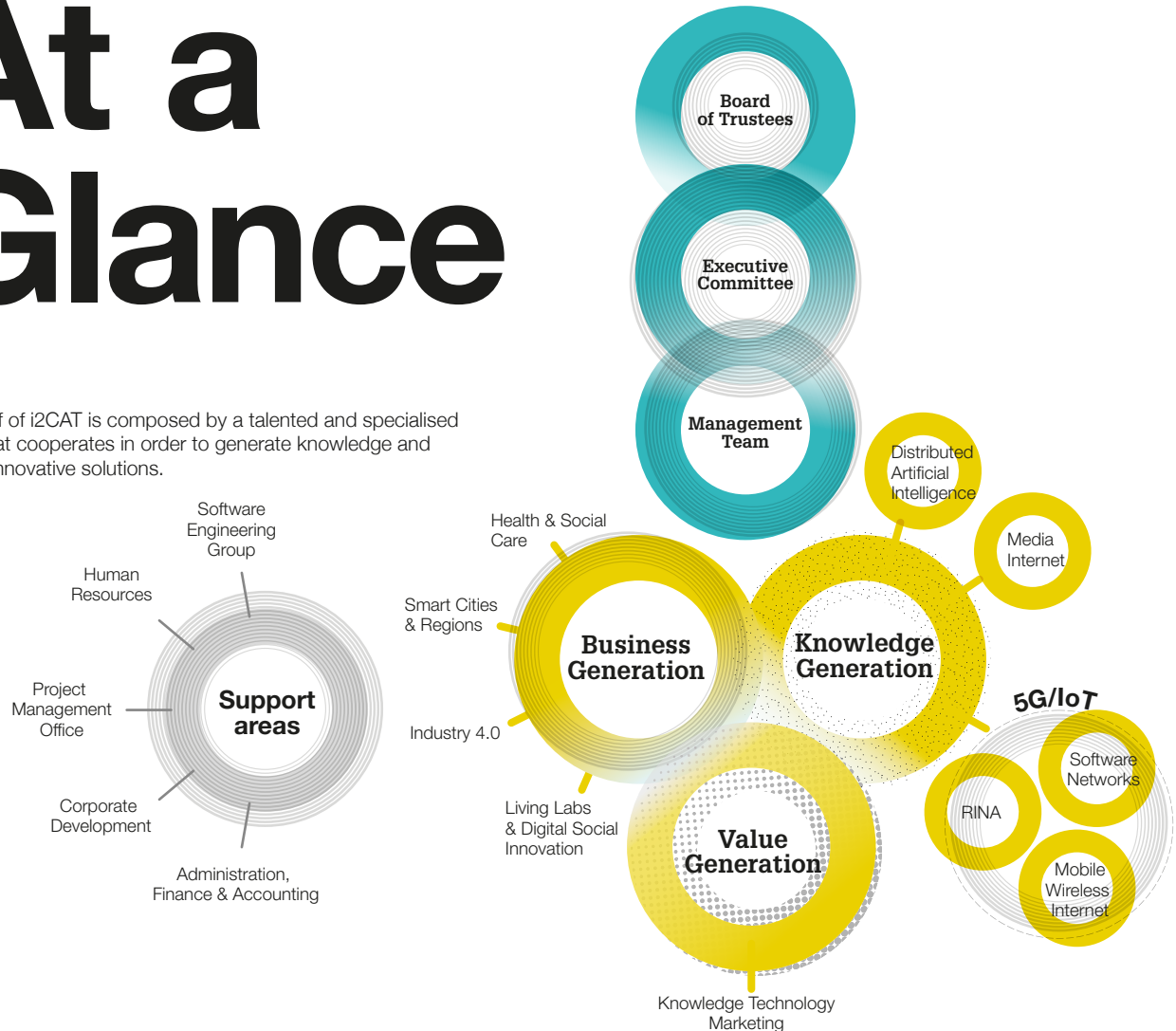

Exhibitions at leading industry events. Our VLP solution has been showcased in events as:
- Hannover Messe
- Ces, Las Vegas
- IOTSWC, Barcelona

At a Glance

The staff of i2CAT is composed by a talented and specialised team that cooperates in order to generate knowledge and deliver innovative solutions.

Board of Trustees

Executive Committee

Management Team

Support areas

- Software Engineering Group
- Human Resources
- Project Management Office
- Corporate Development
- Administration, Finance & Accounting

Business Generation

- Health & Social Care
- Smart Cities & Regions
- Industry 4.0
- Living Labs & Digital Social Innovation

Knowledge Generation

- Distributed Artificial Intelligence
- Media Internet

Value Generation

- Knowledge Technology Marketing

5G/IoT

- Software Networks
- RINA
- Mobile Wireless Internet

Mision and Vision

i2CAT Foundation is a non-profit research and innovation centre which promotes mission oriented R+D+i activities on advanced Internet architectures, Applications and services. The centre stands for a new open innovation framework, fostering the collaboration between companies, public administration, the academic environment and end-users.

Internet has produced a superabundance of data, information and networks. The next step is to advance in the research and innovation of an Internet based on intelligent systems and smart technologies. The Internet of knowledge and creativity is the new challenge to face. The i2CAT vision for the next 10 years is a networked smart world, a co-laboratory based in a new generation of networked intelligent technologies and systems, a co-creating platform between machines, people and the environment for a sustainable and smart future.

Core values

Excellence:
talent, knowledge, experience

Inspiration:
motivation, creativity, challenges

Commitment:
integrity, trust, flexibility

Collaboration:
team, open innovatin, agreements

Value chain

i2CAT's activities span the following three areas:

- **Research**, both International and local level: i2CAT plays a key role in the EU Framework programme for Research & Innvovation
- **Strategic projects:** Leading local initiatives to deploy digital strategies and policies of the Government of Catalonia
- **Technology Transfer:** Fostering R&D collaboration with companies to develop innovative market-oriented solutions

i2CAT integrates cutting-edge research to develop market-oriented solutions
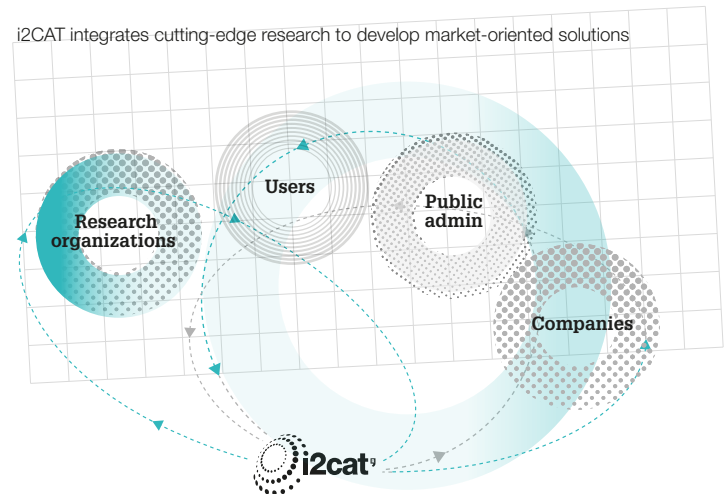
Cooperation & Co-creation to foster business innovation

Applied research → R+d+i projects → Proof of concept → Pre-Commercial solutions → Technology transfer → **Commercialization**

Board of Trustees

As of the 31st of May 2019, the members representatives were:

Executive Committee

As of the 31st of May 2019, the members representatives were:

Mr. Lluís Rovira i Pato,
President, Director at CERCA Institution

Mr. Carles Salvadó Usach,
Vice-President of Delegate Committee, Head of Telecommunications Service at Secretary of Telecommunications, Cybersecurity and Digital Society

Mrs. Montserrat Cereza Carril,
Territorial Manager of Institutional Relations at Orange

Mr. Lluís Anaya Torres,
Data and Innovation Manager for the Centre of Telecommunication and Information Technologies, Government of Catalonia.

Mrs. Ana Simón Villacampa,
Deputy Director of Technological Cooperation at ACCIÓ

Mr. Lluís Comellas i Riera,
Research Vice-Rector at Universitat Ramon Llull

Mr. Boris Bellalta Jiménez,
Teacher of the ICT Department at Universitat Pompeu Fabra

Mr. Xavier Ferràndiz,
vocal, Engineering and Infrastructures Manager of CCMA

Mr. Joan Bennassar,
Technical Manager at Media Pro

Mr. Javier Marcos Álvarez,
Technological Innovation Unit Manager at Cellnex Telecom

Mr. Josuè Sallent Ribes,
Director at TICSalut Foundation

Mrs. Joana Sánchez Morillo,
Sales Manager of Government and Public Services at Vodafone

Mr. Xavier Buxeda Lladó,
General Manager at Fujitsu Technology Solutions in Catalonia

Mr. Xavier Azemar Mallard,
Head of Barcelona Innovation Center at Cisco Systems

Mr. Diego Matas Morillo,
General Manager at Interoute Iberia, S.A.U

Mr. Francisco Rodríguez,
Managing Director at IMI (Barcelona City Council)

Mr. David Noguer i Bau,
Regional Director at Juniper Networks

Mr. Jordi Berenguer Sau,
Vice-Rector for Knowledge Transfer at Universitat Politècnica de Catalunya (UPC)

Mr. Josep Maria Martorell i Rodon,
Deputy Director at Barcelona Supercomputing Center

Mr. Felip Fenollosa Artés,
Director at Fundació CIM

Mr. David Moure Magem,
Business Manager at Epson Ibérica

Mr. Tomàs Roy Català,
Chief Innovation and Strategy Officer at the Centre for Information Security of Catalonia (CESICAT), Government of Catalonia

At a glance

Staff

Management Team

Josep Paradells
Director

Artur Serra
Deputy director

Joan Manel Martín
Managing director

Sergi Figuerola
Chief techonology
& Innovation officer

Pol Delgado
5G/IoT; MWI

Bruno Cordero
5G/IoT; MWI

Jose Antonio García
5G/IoT; MWI

Ferran Cañellas
5G/IoT; MWI

Apostolos Papageorgiou
5G/IoT; Software Networks

Miquel Puig
5G/IoT; Software Networks

Eduard Grasa
5G/IoT; RINA

Miquel Tarzán
5G/IoT; RINA

Ignacio Reimat
Media Internet

Juan Francisco Martínez
Media Internet

Gianluca Cernigliaro
Media Internet

Marc Martos
Media Internet

Research areas

Daniel Camps
5G/IoT; MWI

Maria Luisa Catalán
5G/IoT; MWI

August Betzler
5G/IoT; MWI

Miguel Catalan
5G/IoT; MWI

Joan Josep Aleixendri
5G/IoT; MWI

Shuaib Siddiqui
5G/IoT; Software Networks
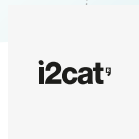
Carolina Fernández
5G/IoT; Software Networks

Pouria Khodashenas
5G/IoT; Software Networks

Javier Fernández
5G/IoT; Software Networks

Hamzeh Khalili
5G/IoT; Software Networks

Marc Roig
Distributed Artificial Intelligence
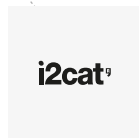
Sergi Mercadé
Distributed Artificial Intelligence

Sergi Fernández
Media Internet

Isaac Fraile
Media Internet
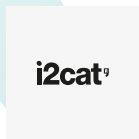
Einar Meyerson
Media Internet

Support Areas

Flaminio Minerva
PMO

Jose Miguel Sanjuan
PMO

Mónica Fernández
PMO

Jan Vara
PMO

Violeta Morquecho
PMO

Staff

Ana Paula Solis
PMO

Rocío Segura
Administration
Finance
& Accounting

Sonia Beltrán
Administration
Finance
& Accounting

Roger Onnen
Human Resources

Susana Otero
Corporate
Development

Míriam Castillo
Corporate
Development

Ivan Rodríguez
Corporate
Development

Anna Civit
Corporate
Development

Development
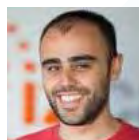
Julio Carlos Barrera
Software
Development

Alfonso Egio
Software
Development

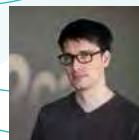**Josep Pons**
Software
Development

Andrea Cervera
Software
Development

Ricardo González
Software
Development

Belén Pousa
Software
Development

Adrià Sanchez
Software
Development

Dolores García
Software
Development

Knowledge & Technology Marketing

Santiago López
Software
Development

Sergi Solvez
Software
Development

Lucio Fernandez
Software
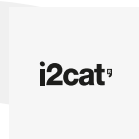Development

Naci Kurdoglu
Software
Development

Miguel Angel Perez
KTM

Rafael Nualart
KTM

Mireia Casanovas
KTM

Daniel López
KTM

Tomas Escuin
KTM

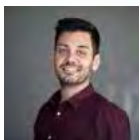## Innovation Business Development

Alba García
KTM

Rosa Paradell
Innovation Business
Units

Sílvia Castellví
Innovation Business
Units

Marc Vicente
Innovation Business
Units

Arnau Sala
Innovation Business
Units

Xavier Nuñez
Innovation Business
Units

David Quiñones
Innovation Business
Units

Raul Iglesias
Innovation Business
Units

Jordi Daura
Innovation Business
Units

Official Certifications

Associations, Standardization Organizations & Platforms

Generalitat de Catalunya
Government of Catalonia

Ajuntament de Barcelona

UNIVERSITAT RAMON LLULL

upf. Universitat Pompeu Fabra Barcelona

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH
UPC

orange

cellnex
driving telecom connectivity

JUNIPER
NETWORKS

CISCO

vodafone

EPSON

FUJITSU

interoute
from the ground to the cloud

MEDIAPRO

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