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**Question(s):** All/20

Geneva, 25 November-6 December 2019

**CONTRIBUTION****Source:** National Technological University**Title:** Analysis and applications of Internet of Things and smart cities based on telecommunications and security - UTN Resistencia Regional Faculty**Purpose:** Information

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**Contact:** Diego Bolatti Tel: +543624432628  
National Technological University E-mail: [dbolatti@frre.utn.edu.ar](mailto:dbolatti@frre.utn.edu.ar)  
Argentina

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**Contact:** Sergio Gramajo Tel: +543624432628  
National Technological University E-mail: [sergiogramajo@gmail.com](mailto:sergiogramajo@gmail.com)  
Argentina**Keywords:** IoT, ICTs, projects, research, development, innovation, SG20**Abstract:** This contribution details the implementation of the IoT research project at the Resistencia Regional Faculty ICT Research Centre.

This contribution was presented at the SG20RG-LATAM meeting held on 11 September 2019 in San Salvador (El Salvador). During the meeting, the group decided to forward it for information purposes to the Study Group 20 meeting to be held from 25 November to 6 December 2019.

The National Technological University (UTN) set up a pilot project for the development of IoT research and development (R&D) centres. The main objective of the project is to implement IoT R&D centres in order to drive research through the university system with the involvement of relevant research teams in the different regional faculties.

The Information and Communication Technology Research Centre (CINAPTIC) operates within the Resistencia Regional Faculty. In the course of its work it has created a project entitled "Analysis and applications of IoT and smart cities based on telecommunications and security". Work is currently under way to develop prototypes, services and research into security in IoT. A further major objective is to participate actively in ITU activities.

Annex I to this contribution details the activities carried out, in order to share the results achieved, with the idea that they may be replicated by any Latin American academic centre.

## **Macro project**

### **Introduction**

The objectives of UTN's IoT project include collaboration with international entities and with small and medium-sized enterprises (SMEs) for the development of IoT technologies. It also aims to pave the way for R&D to be implemented in the region in which it is carried out and to create an opportunity to develop applications geared to the specific requirements of a given area or region. Acknowledging the aim of establishing IoT R&D centres and embedding the R&D in the host community, and of creating links with different entities in the IoT ecosystem, the Resistencia Regional Faculty has backed this plan and undertaken various activities.

### **General objectives:**

- Create an ecosystem for innovation in IoT through cultural awareness-raising and the elaboration of public policies.
- Promote the participation of UTN in ITU, in particular in Study Group 20 on IoT and smart cities and communities (SC&C).
- Establish IoT R&D centres to drive research through the university system.

### **Objectives for the Americas region**

- Share the results in Latin America through ITU and international and regional ICT organizations.
- Propose to ITU the creation of IoT R&D centres in other countries in the region.
- Foster the interconnection of all centres and universities in an IoT R&D regional network through international organizations.

This will endow the Americas region with an interconnected network of universities and SMEs, making it possible to exchange information and develop technological products and applications. The focus will be on serving the communities and regions in which each research centre operates. The participation of private companies and chambers of commerce is secured through specific agreements with the Regional Faculty.

### **Technological linkage**

- Efforts are made to establish relations with SMEs in the region that are interested in the development of applications for their activities.
- Work is carried out in coordination with the regional faculties interested in conducting IoT research.
- The creation of new R&D centres in the different regions is encouraged.
- Efforts are made to conclude collaboration agreements with technology and ICT services companies (preferably SMEs).
- Technology companies can participate in the project by providing equipment, information and access to systems, based on specific agreements concluded with UTN.
- Chambers of commerce for technology and services can also collaborate with the research centres in the development of possible start-ups.

## **Resistencia Regional Faculty project**

### **Introduction**

Exponential population growth, urbanization and the development of communication technologies have given rise to new methods of generating applications to improve municipal services, having a direct impact on quality of life and the environment. In turn, this has opened up research areas in relation to IoT, smart cities, security and management of telecommunications where multiple

connected devices interact intelligently and with minimal human intervention. In the light of this phenomenon, current research, standardization bodies and specialized enterprises have put forward different ways of generating smart city and IoT applications. However, the necessary architectures, culture, techno-economic feasibility studies, ICT use, climatic considerations, local and national standards governing the use of telecommunications and the spectrum, and the political situation, as well as other relevant factors, are important to proposing workable solutions for a country or region.

### **Implementation context**

This project is being implemented by the research centre under the Resistencia Regional Faculty of the National Technology University (UTN). Its primary objective is to contribute R&D and applied innovation to the Faculty-Community relationship, produce research results that enhance services and products used by the public, participate in State projects and establish synergies with local, national and international companies with a view to establishing collaboration agreements which strengthen institutional relations and ensure that the university plays an important role in local and regional technological development.

**PROJECT TITLE: “Analysis and applications of Internet of Things and smart cities based on telecommunications and security”**

### **SUBPROJECTS (R&D themes)**

**Design and development of a remote monitoring device for water quality (in collaboration with the research group of the Chemical Engineering degree programme)**

Project code: MSIAIRE0004909TC

**Abstract:** Water is an indispensable good and its pollution harmful to humans, animals and plants. Analysis of the most pertinent water quality parameters, using a permanent sensor-driven monitoring system, could quickly provide a larger, useable data resource on surface water quality. The design of an economic prototype has been proposed, based on the incorporation of technological solutions and using sensors to determine key physiochemical parameters in bodies of water, as well as transferring results remotely to a central station for the monitoring of water quality. The device will be tested and validated in laboratory conditions and subsequently installed in a body of water (lake) in Resistencia, Chaco province. This will serve to establish a linkage among the most relevant parameters defining the quality of this water. Using only electronics programmable with open-source software will help to achieve a reliable, user-friendly, universal and economically viable product. While not seeking to push the boundaries of scientific knowledge, the project is highly likely to have an impact on the environment through the monitoring, control and prevention of environmental pollution, in particular in bodies of surface water. Although there are examples of similar technologies in Argentina, there is no technology anywhere in north-east Argentina which can provide ongoing remote control of water quality parameters. This is likely due to high equipment costs and the lack of innovative technological developments. The commissioning of this prototype will provide State bodies with strategic information for decision-making and more rigorous enforcement of the prevailing legislation.

### **Security framework**

**Abstract:** The Internet of Things will not only connect computers and mobile devices, but also facilitate the interconnection of smart cities, buildings and homes, as well as power grids, water and gas networks, automobiles, aircraft, etc. IoT will drive the development of a wide range of advanced information services which require processing in real time. However, IoT services and infrastructure pose real security challenges due to the significant increase in attack surface, complexity, variety and quantity of resources. We are in the process of developing an IoT security framework for intelligent infrastructures, such as smart homes, smart grid, smart connected health and other IoT-based applications. This subproject is based on ITU Recommendation ITU-T Y.4806 (<https://www.itu.int/rec/T-REC-Y.4806-201711-I/es>)

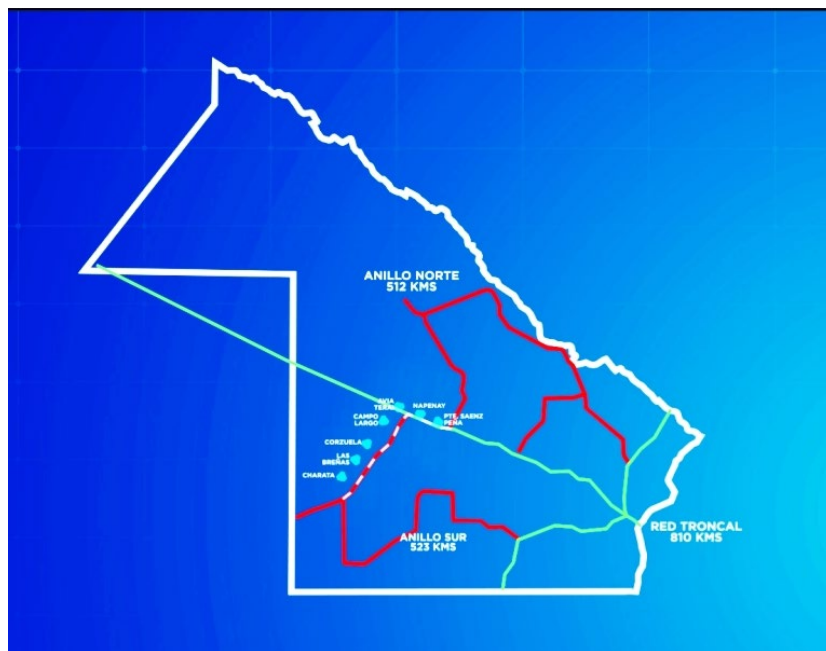
## SDN book

**Abstract:** Production of an electronic book (e-book) summarizing research work on next-generation networks. This book will be used for instruction purposes on the Information Systems Engineering degree programme at the Resistencia Regional Faculty.

ISBN: 978-987-86-1677-3

## Meteorological station (technology transfer with ECOM)

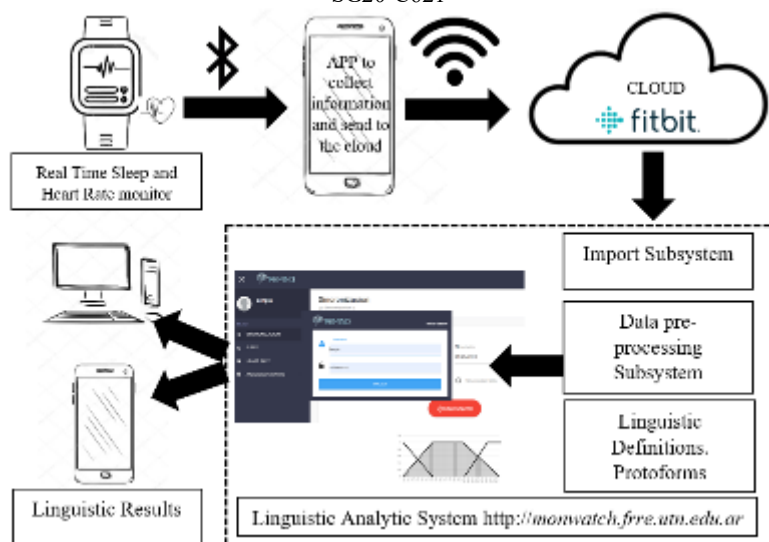
**Abstract:** Technology transfer work with ECOM Chaco S.A., a State company. The research team contributes through the development of software and an analytical data model to support the deployment of a network of environmental sensors across the Chaco province via ECOM's around 2 200km of optical fibre network throughout the province.



## FITBIT bracelet

**Abstract:** A subproject involving the development of software to support the analysis of data collected by a smartwatch. URL: <http://monwatch.frre.utn.edu.ar/>

*Sensors. Linguistic data summaries of sleep quality and heart rate monitoring with wearable device cloud database.*



## Street lighting, Corrientes Municipality

**Abstract:** A consultancy agreement concluded with the Municipality of the city of Corrientes on the development of an automated street lighting control system through sensor technology and communications using the LoRaWAN network.

### Technology company agreements

**ECOM Chaco SA for development and transfer of technologies and provision of funds for the procurement of equipment for the research team.**

- A Chaco province public company responsible for a 2 200km optical fibre network throughout the province. It also provides software development, datacentre and last-mile connectivity services. The agreement concluded with the faculty allows for the development of IoT solutions for application at the province level and transfer of knowledge and new products.

**Municipality of Corrientes** for consultancy and technology transfer.

- Public entity whose objectives include the development of productive models using IoT technology.

**YEAP** for the provision of research equipment (LoRaWAN).

- The local LoRaWAN operator has invested more than USD 30 million in Argentina in recent years. Its network is being deployed, based on a robust strategy for enhancing coverage and introducing new products. With this in mind, a collaboration agreement was signed with the university. By installing nodes in our buildings, we will obtain network coverage for carrying out all types of tests on the network. Furthermore, closer contact with the service provider facilitates more in-depth understanding of results, thereby supporting advanced R&D.

**WND LATAM** for the provision of research equipment (SIGFOX).

- Through its Sigfox network, WND Argentina boasts a coverage of 20 million people, a figure which is expected to rise to 29 million by the end of 2019. The agreement concluded with this operator similarly supports the development of prototypes and low-level research

on the network. With these options available, it is possible to draw real comparisons, under the same conditions, for the evaluation of different technologies and features for each particular project. In addition, with coverage in the area, it is possible to put forward proofs of concept in the faculty's impact area.

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