ICT-601102 STP TUCAN3G

Wireless technologies for isolated rural communities in developing countries based on cellular 3G femtocell deployments

4th Quarterly Management Report

Reference Period *(from 01.11.2013 to 31.01.2014)*

Project coordinator

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Consortium composition

1 *UPC*
2 *URJC*
3 *PUCP*
4 *UCAU*
5 *FITEL*
6 *IPA*
7 *TdP*
8 *EHAS*
9 *TIWS*
10 *CREP*
11 *KINNO*

1 – Project status: Technical plan and corresponding achievements

WP1: Management

1A1: Administrative management

- UPC has been continuously linking EC and consortium, and maintained management and communication infrastructure (website, mail lists, RSS, dropbox). UPC has also cooperated with URJC in evaluating risks and reviewing documents before delivery to the EC.
- EHAS and UPC organized the third Plenary Meeting in Madrid (21-22 November).

1A2: Technical management

- UPC has coordinated the activities of 4A2 and 4A3. UPC also did the final editorial checking of deliverables and milestones before submission to the EC.
- URJC reviewed and commented milestones M42 and M52, deliverables D61 on technical management perspective. As a part of standard procedure of technical coordination, URJC accomplished monthly activity tracking through Redmine tool, milestone and deliverable tracking, risk analysis for this quarter. On the other hand, 3rd preliminary project meeting was handled in Madrid with other partners' contributions.
- PUCP has participated in the third plenary meeting in Madrid and has participated in administrative and technical coordination of WP6.
- UCAU has coordinated activities in WP7.
- FITEL
- EHAS

WP2: Requirements and specifications

2A1: Technical and socio-economic scenarios

- UPC
- URJC
- PUCP
- FITEL
- TdP
- EHAS

2A2: Requirements and specifications for transport and access networks

- UPC
- URJC
- EHAS
- TIWS

2A3: Parameters and scope of market research and business models

- UCAU
- FITEL
- TdP
- EHAS
- CREP
- KINNO
- IPA

2A4: Architecture for the demonstration platform

- PUCP
- IPA
- TdP
- EHAS

WP3: Business case study

3A1: Market study

- UCAU
- FITEL
- TdP contributed to the research questions and Application of the research method to business users. This task was updated from M8.
- CREP. During this period, CREP carried out a new cycle of interviews and analysis of private and institutional users, this time in the native community of Coconuco, as a complement to the work carried out in Silvia.
- IPA
- KINNO
- EHAS has carried out the analysis of results of the interviews with Responsible of Rural Areas in Peruvian Operators, drawing up the main lines identified from operators' perspective for the market survey (D31). Due to the delay in this deliverable, EHAS has also contributed to WP3 supporting the coordination of activity 3A.1 in order to collect the results for D31.
- KiNNO has been working on coordinating the whole activity, providing feedback on partners input, harmonizing all relevant data and drafting and final report/deliverable of this Task.

3A2: Product definition

- FITEL
- TdP. TdP´s contribution to this task is to develop a model funded by a public-private association taking advantage of the government funds and operators experience and know how saving transport bandwidth and energy cost.
- EHAS

3A3: Models for funding and return on investment

- UCAU. Initial considerations for identification of technical critical success factors.
- FITEL
- TdP. TdP´s contribution to this task is to evaluate and optimize the OPEX cost of structure, and also to identify the technical activities and key partners
- EHAS

3A4: Business model design and verification

- UCAU
- FITEL.
- IPA
- TdP
- EHAS
- CREP

- KINNO

WP4: Access network optimization

4A1: Network dimensioning

- UPC has generated new results to complete the network dimensioning. First, a new deployment for Negro Urco based on two separate HNB and towers has been evaluated and found the most effective solution to provide voice and data service. Second, it has been observed that when data services are sustained by a 64 Kbps connection in the physical layer, the joint voice and data service is possible in those communities where coverage was the main limitation. A new version of D41 has been issued collecting these results.
- TdP generated verification results with the corporate network planner.

4A2: Femtocell network optimization and monitoring

- UPC has been working on the development and evaluation of techniques for switching ON/OFF the HNB's under the objective of minimizing the power consumption while still guaranteeing a given quality of service in terms of blocking probability. These techniques will allow switching OFF a HNB when the traffic load is low. In addition, a study is being carried out to calculate robust estimators for the traffic load in order to establish new thresholds over such estimates for the switching ON/OFF procedure. In combination with ON/OFF strategies, UPC is also working on procedures for allowing the cell range expansion. In a first step, we are taking into account how the users are associated to the serving cell in order to have a load-balanced system. The criteria might consider the number of current associated users, remaining battery level or allowed interference in the uplink (UL) transmission, including the UL performance on the user-association decision.
- URJC has analyzed and tested the existing algorithms for frequency and primary scrambling code assignment. Novel algorithms tailored for Tucan3G are under development.
- IPA completed its plans for M42 after discussion. In addition IPA developed a model for data bandwidth use in uplink and downlink for various configurations (IPSec/No IPSec, uplink multiplexing, selection of voice codec and underlying transport.). IPA has started working on investigating architecture configurations in Sta Clothilde for combining 2G voice and 3G data; this is proving challenging as it is unclear whether this was fully contemplated in original 3GPP designs. There has also been interaction with UPC on power consumption, possible management of remote on/off switching for the optimization of power consumption. Some delays due to the holiday period.

4A3: Access and transport network interoperability

- UPC has been working in the problem of power and code allocation for mixed voice and data users in a single-cell environment, both for the uplink (UL) and the downlink (DL). Partial developments have been already included in the deliverable M43, where the voice users are prioritized over the data users. A schedule and plan of tasks for finishing this work and to extend the results to the multi-cell case have been defined.
- URJC tested different offloading solutions via numerical simulations. Although simulations confirm that both data and voice offloading will be beneficial, it is noted for the offloading final decision that the standard does not allow the voice offloading due to legal issues. On the other hand, URJC reviewed the state of art and analyzed different alternatives for network/energy aware scheduling over discussions with other partners, initial steps to define the interaction (interface) with the transport network were taken.
- IPA has completed its plans for M43. It has also been engaged with URJC on whether and how dynamic bandwidth management schemes making use of backhaul state knowledge can be implemented into the current product schema for deployment. Work will be coordinated with URJC work in WP5 towards the next deliverable
- TdP. TdP´s contribution to this task is to provide web caching traffic offloading optimization techniques applicable to the TUCAN 3G project in Telefonica´s transport network; TdP also shared some technical testes results of bandwidth savings.

4A4: Beyong 3G-based access

- UPC
- URJC

WP5: Transport network optimization

5A1: Usage terms of WiFi, WiMAX and VSAT links

- URJC
- PUCP
- UCAU
- TIWS

5A2: Heterogeneous transport network architecture for the backhaul

- URJC has delivered M52. Based on the revised state of art and on D51, a backhaul network architecture has been theoretically proposed, with the definition of the interfaces. A few aspects such as access control mechanism and use of either MPLS/DiffServ for internal traffic management in the backhaul network are described with alternatives and will be investigated in detail in a further work. Also the laboratory for the experiments has been prepared.
- PUCP
- UCAU. Remote tests made on the heterogeneous WiFi-WiMAX testbed at URJC, in order to define and verify the mapping and coupling of these two technologies. Collaboration in the definition of tools for traffic measuring and simulation. Contributions to sections 2.4 and 4.1 of M52.
- TIWS has made its contribution to M52. It reports how VSAT systems acting as gateways from the rural transport network to the Internet and the operator's core network should interface WiLD/WiMAX/femtos for optimal QoS support. Also TIWS is preparing the installation of two VSAT stations for the lab testing.

5A3: Transport network optimization

- URJC has identified the variables that may be controlled in each node of the backhaul network, in order to determine which of them can be considered in optimization problems. In connection with 5A2, restrictions associated with performance and QoS that must be guaranteed have been also identified.
- PUCP
- UCAU
- TIWS

WP6: Demonstration platform

6A1: Technical and operational design

- PUCP has completed the design of modifications to be made in target networks.
- FITEL
- IPA has had preliminary discussions on product solutions and some further details about product performance. It is an outstanding issue as to how to weatherproof the units
- TdP
- EHAS

6A2: Compatibility tests

- UPC.
- URJC has accomplished to identify the basic aspects of the compatibility between the backhaul and the access network, even though this activity is slightly delayed due to other delays in WP6. Compatibility test

results will be submitted as soon as the definitive purchase is clear. The topology determined in M52 indicates that the interaction between the access network and the backhaul happens through an IP router. The physical interconnection is straight-forward, as well as DSCP marking at the IP layer.

- PUCP has continued a series of coordination with FITEL about the concretion of the funding agreement and now, a schedule is already defined for this purpose. PUCP has worked in the elaboration of detailed list and in the respective quotations of the equipment and materials for demonstration platform. Also, PUCP has made coordination with Telefonica in order to prepare the importation of femtos and femto-controller.
- FITEL
- IPA has provided quotation for equipment in the Madrid Test lab. Further progress will be delayed until the purchase funding is resolved.
- TdP continued to contribute in this task providing the compatibility test for operation, manage and configuration to connect IP Access RNC to TdP´s voice and data core network and the integration guide to install and integrate IP Access Equipment in TdP´s Node in Lima for the validation of the model designed by TUCAN 3G in a real scenario.
- TIWS has made the report about “Protocols for assessing the compatibility of interconnection between the transport network VSAT and femtocells”.

6A3: Pilot network deployment

- PUCP has made coordination with the beneficiaries of existing networks and it has made a first version of a detailed installations plan (Gantt). Also, M61 has begun to be developed.
- FITEL
- IPA
- TdP is working with PUCP to develop the preliminary plan for installation and configuration of core network equipment.
- EHAS
- TIWS

6A4: Interconnection to the operator’s network

- PUCP
- FITEL
- IPA
- TdP
- EHAS
- TIWS

6A5: Validation

- PUCP
- UCAU
- FITEL
- TdP
- EHAS
- TIWS

WP7: Dissemination and knowledge utilisation

7A1: Dissemination

- UPC has been preparing two papers on the activities of 4A1 and 4A2.

- URJC. Although URJC continues to look for any dissemination opportunity, being in the early stage to publish the results of the lab tests limits the availability.
- PUCP has looked for dissemination opportunities in Perú and has updated project information in its web site.
- UCAU: Contributed to D71 "First interim dissemination/standardisation report and plan".
- FITEL
- IPA
- TdP published an article in its Intranet and gave access to other parnters to it. TdP communicacion office is preparing the next publication.
- EHAS has continued to organize the technical workshop. In the 3rd Plenary Meeting it was agreed that this event will be held on the first semester of 2015, so EHAS has identify and contacted responsible people of some appropriate congress in this period to co-locate the workshop. Moreover, EHAS has contributed to the dissemination of TUCAN3G organizing a lab with UPC for the forum European Development Days about science and innovation for development (Brussels, 27 Nov: http://eudevdays.eu/topics/science-and-innovation-development, http://eudevdays.eu/topics/ict-4-social-change).
- TIWS
- CREP. The work with Comics in the WEB continues with dialogues about the characterization of the target population of the TUCAN3G project and the participation of the operators. The CREPIC Team presents the TUCAN3G Project to the Kokonuko native community, in some regions of the State of Cauca, in order to characterise the rural population. The CREPIC Team produces and posts a newsletter on the WEB, in order to spread and share information about the importance of these developments with the community.
- KINNO

7A2: Standardisation

- UPC has defined a strategy together with IESI, TdP and IPA to contribute to ETSI-BRAN, starting in June 2014.
- UCAU continued with actions for keeping track the activities of the IEEE 802.11 Working Group.
- IPA has had discussions with UPC, Telefonica and the company 4GCellX on where best to disseminate the standards results. Following agreement, IPA has jointly supported the creation of a work item within ETSI BRAN for this purpose.

7A3: Use of knowledge

- FITEL
- IPA
- TdP
- TIWS
- KiNNO

2 – Unattained planning items and rationale

Item description	Action Items
Changes in schedule of deliverables	D31 scheduled in M8 (Aug 2013) has been delayed to M14 D61 scheduled in M8 (Aug 2013) has been delayed to M14 D71 scheduled in M12 (Jan 2014) has been delayed to M14
Changes in schedule of milestones	Milestone M32 scheduled in M11 (Dec 2013) has been delayed to M17 Milestone M43 scheduled in M11 (Dec 2013) has been delayed to M14 Milestone M31 scheduled in M9 (Oct 2013) has been delayed to M15

Red flags	
Any other issues or problems that might affect achievement.	Delays in the delivery of funding by FITEL are putting off the purchase of equipment and hence activities in WP6. The current view is that funds might be available by end April 2014.

3 – Deliverables and milestones finished as planned

Deliverables and Milestones in the reporting period		
Document code and title	Originally planned	Actual delivery month
D41 UMTS/HSPA network dimensioning	M6	M10
M42 Procedures for UMTS/HSPA network optimization and control	M9	M11
M52 Transport network architecture and interface to the access network	M11	M12
D71 First interim dissemination/standardisation report and plan	M12	M13

4 – Dissemination

4.1 Articles published, presentations at conferences, TV broadcasts, etc.

- **Submitted papers**
  -
- **Accepted papers**
  -
- **Presentations**
  - The CREPIC Team presents the TUCAN3G Project to the community of teachers and scientists from Popayan, in the FIRST UNIVERSITY CONFERENCE ON LOCAL RESEARCH: ESAP 2013 TERRITORIAL CAUCA, in order to spread the development of the project.
- **Press releases (use the links on text to access the documents)**

4.2 Web Sites

The project website (www.ict-tucan3g.eu) was setup in Dec 2012 and has been continuously updated since then. An RSS channel has been included.

4.3 Other relevant information: Patent applications, guidelines standards, Masters, PhDs….

5 – Meetings Held

Meetings, Phone Conferences, Conferences or Workshops attended

Partner	**Dates**	**Meeting place**	**N° of persons**	**WP/Task/expected results/details**
PUCP, FITEL	4 November 2013	FITEL office	3	WP6, 6A2.1 internal discuss about agreement. FITEL will send final version at November 7th
ALL	21 and 22 November 2013	ETSIT UPM (Madrid)	23	3rd plenary meeting of the project in Madrid

Partner	Dates	Meeting place	N° of persons	WP/Task/expected results/details
UPC, URJC, EHAS	12 November 2013	Conf. call	---	Definition of scenarios within the framework of 4A2 for the development and evaluation of techniques to save energy.
URJC, UNICA, TIWS	November 2013	Conference Call	9	WP5 – Content definition for M52
PUCP, URJC, FITEL	29 November 2013	FITEL office	5	WP6, 6A2.1 internal discuss about agreement. FTIEL changes process for funding and a first version of schedule was elaborated.
PUCP, TdP	5 December 2013	TdP office	2	Discussion about networks interconnections
TIWS	19 December 2013	URJC	3	WP5 – Site Survey for the installation of two VSAT stations (lab testing).
UPC, IPA, URJC, TdP	December 2013	Conference Call	6	WP4, 4A3. Internal discussion to define a set of concrete tasks to be developed within activities 4A3, incorporating new activities from IPA
URJC, PUCP, UNICA, TIWS	20 January 2014	URJC	6	WP5 – General review and follow-up.
PUCP, TdP	21 January 2014	TdP office	3	WP6 6A2.1 and 6A2.6 Internal discuss about procedure for equipment importation and installation plan
UPC, TdP, URJC	21 Januanry 2014	Conference CAll	6	WP4: 4A3 Internal discussion about the work to be carried out by TdP in activity 4A3 and evaluation of a proposal from TdP
UPC, URJC	27 January 2014	Conf. call	---	Review of the status and the activities to be done on activities 4A2, 4A3, and 4A4.
URJC, UNICA, TIWS	January 2014	Conference Call	7	WP5 – Technical definitions for D52
4GCellEx, IPA, UPC, TIWS				WP7 Internal Discussion on ETSI BRAN

6 – Resources Employed/Expenditures

Reference Period: "1 Nov 2013" to "31 Jan 2014"
Effort for the reference period per WP and per Participant (Person-Months): planned vs. actual spent

	WP1		WP2		WP3		WP4		WP5		WP6		WP7		Total per participant		Total Cumulative from start of the project		*Justification (if needed)*
Participant	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent	
1 – UPC	0,84	**0,84**	0,00	**0,00**	0,00	**0,00**	2,58	**3,80**	0,00	**0,00**	0,00	**0,00**	0,45	**0,60**	3,87	**5,24**	13,9	**15,7**	
2 – URJC	1,20	**2,48**	0,00	**0,00**	0,00	**0,00**	1,59	**2,55**	2,68	**3,35**	0,64	**0,30**	0,15	**0,00**	6,26	**8,68**	20,4	**24,8**	
3 – PUCP	0,11	**0,11**									4,37	**1,36**	0,15	**0,15**	4,63	**1,62**	19,7	**11,5**	**FITEL funding is delayed**
4 – UCAU	0,10	**0,10**			0,06	**0,06**			0,42	**0,42**			0,42	**0,42**	1,00	**1,00**	3,9	**3,9**	
5 – FITEL															0,00	**0,00**	2,5	**1,9**	
6 – IPA							1,00	**0,50**			1,00	**0,10**			2,00	**0,60**	5,1	**3,1**	**M43, M42 lagged.WP6 delay due to FITEL contract delay**
7 – TdP	0,00	**0,00**	0,00	**0,00**	0,88	**0,98**	0,25	**0,25**	0,00	**0,00**	0,51	**0,51**	0,05	**0,05**	1,69	**1,79**	6,9	**6,9**	
8 – EHAS	0,25	**0,25**			0,50	**1,00**					1,50	**0,00**	0,00	**0,27**	2,25	**1,52**	13,5	**9,5**	
9 – TIWS									0,50	**0,50**	0,25	**0,20**			0,75	**0,70**	2,8	**2,5**	
10 – CREP					0,10	**0,10**							0,15	**0,15**	0,25	**0,25**	2,2	**2,2**	
11 – KINNO						**1,25**									0,00	**1,25**	1,7	**4,5**	
Total per WP	2,50	**3,78**	0,00	**0,00**	1,54	**3,39**	5,42	**7,10**	3,59	**4,27**	8,27	**2,47**	1,37	**1,64**	22,70	**22,64**	**Grand total for the ref. period**		
Total Cumulative from start of the project	9,81	11,36	16,52	14,80	7,49	9,14	17,22	19,09	14,91	15,66	20,52	9,80	6,03	6,63	92,50	**86,46**	**Grand total from start**		

Expenditures for the reference period per Participant (k€, EURO*1000): planned vs. actual spent

	Durable equipment		Subcontracting		Travel and subsistence		Consumables		Protection of knowledge		Other Specific Costs			Total per participant		Total Cumulative from start of the project		*Justification (if needed)*
Participant	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent	plan	spent		plan	spent	plan	spent	
1 – UPC														0,00	**0,00**	10,5	**10,5**	
2 – URJC														0,00	**0,00**	2,3	**2,2**	
3 – PUCP					6,06	**6,06**								6,06	**6,06**	22,8	**22,8**	
4 – UCAU	1,62	**1,62**			2,50	**1,62**								4,12	**3,24**	7,9	**8,2**	
5 – FITEL														0,00	**0,00**	0,0	**0,0**	
6 – IPA														0,00	**0,00**	0,0	**0,0**	
7 – TdP														0,00	**0,00**	0,0	**0,0**	
8 – EHAS					0,00	**0,40**								0,00	**0,40**	3,8	**3,0**	
9 – TIWS														0,00	**0,00**	0,0	**0,0**	
10 – CREP					2,00	**1,33**								2,00	**1,33**	8,3	**7,6**	
11 – KINNO						**1,12**								0,00	**1,12**	0,8	**7,3**	
Total per cost item	1,62	**1,62**	0,00	**0,00**	10,56	**10,53**	0,00	**0,00**	0,00	**0,00**	0,00	**0,00**		12,18	**12,15**	**Grand total for the ref. period**		
Total Cumulative from start of the project	10,5	10,4	0,0	0,0	41,2	46,7	4,6	4,6	0,0	0,0	0,0	0,0		56,4	**61,7**	**Grand total from start**		

7 – Changes in personnel

Personnel leaving the project		
Name	Partner	WPs involved

Personnel joining the project			
Name	Partner	WPs involved	Expected participation (in months)
Javier Rubio	UPC	WP4	

Javier Rubio received his B.S. in Electrical Engineering degree (highest honors) and the M.S. in Electrical Engineering degree (highest honors) both from the Universitat Politècnica de Catalunya (UPC) in July 2010 and July 2012, respectively, and since December 2012 he is working towards his Ph.D degree. He is also pursuing a M.S. in Aerospace Engineering at UPC. From September 2009 to July 2010 he was with the Wireless Access Research Center at University of Limerick, Ireland, where he developed his B.S. thesis in the field of cognitive radio networks. In April 2011 he joined the Department of Signal Theory and Communications at UPC where he worked as a Research Assistant in the Array and Multichannel Processing group until December 2012. His main research interests include energy-aware resource allocation, energy harvesting techniques, optimization theory, and heterogeneous networks.