Exploitation and Dissemination Plans and 2nd year activities

D7.3

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Partner Name	Short name	Country
SCUOLA SUPERIORE DI STUDI UNIVERSITARI E DI PERFEZIONAMENTO SANT'ANNA	SSA	Italy
UNIVERSITAT POLITECNICA DE CATALUNYA	UPC	Spain
RESEARCH AND EDUCATION LABORATORY IN INFORMATION TECHNOLOGIES	AIT	Greece
ERICSSON AB	EAB	Sweden
PROMAX ELECTRONICA S.A.	PRO	Spain
OPTRONICS TECHNOLOGIES A.B.E.T.E.	OPT	Greece
III V LAB GIE	35L	France
BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY	BT	United Kingdom

Abstract:
This deliverable reports the actions taken by the COCONUT consortium in terms of dissemination and exploitation of the project results during the 2nd year of the project covering the period from November 2013 to October 2014. It also summarises the opportunities for commercialisation, exploitation and standardisation identified by the industrial partners in the second year of the project. The next steps are also identified herein.

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1. Introduction

COCONUT comes to meet the requirements of the next generation access networks with improved features with respect to reach, bandwidth, number of users and cost-effectiveness. Nonetheless, COCONUT is not targeting an alternative to NGPON2 but rather aspires to influence the definition of NGPON3. In terms of dissemination, the goal of the consortium is to clearly communicate this objective to the interested parties with activities that targeted both the research and the industrial community. These activities are reported in the first part of this deliverable.

During the second year of the project the consortium defined the COCONUT solutions that meet the requirements set in the first year of the project. Therefore, having a more comprehensive view of the capabilities of COCONUT, the purpose of the second part of this deliverable is to identify/update potential contributions for commercialisation, exploitation and standardisation. BT, Ericsson, 35L, Optronics and Promax explain how they foresee to exploit the COCONUT innovations and comment on the commercialisation opportunities. In the end of the document, we include an update on the related standardization efforts.

2. Dissemination Activities and Plans

To disseminate the project results and promote its visibility several actions were taken by the different partners:

- The project web site has been regularly updated with all public information concerning the project, including its public deliverables.
- In addition to the website, project news has been communicated to the public through various channels such as Twitter and RSS feeds.
- Significant presence and presentation of the COCONUT concept and solutions at the most relevant conferences and events in 2014.
- Submission of scientific papers to the most significant journals in the field.

2.1. Website

The website of COCONUT (www.ict-coconut.eu) acts as a point of reference both for the external visitors and the consortium members. The content of the website is being regularly updated with information about the project concept, latest achievements, news and events. Partner OPTRONICS, as the COCONUT dissemination leader, established and maintains the COCONUT web-site. At the time of compiling this deliverable more than 12000 visitors have accessed our website. Apart from utilizing the project webpage as the main communications channel, OPTRONICS has established a Twitter account (https://twitter.com/ict_coconut) and an RSS feed to communicate the projects results, news and achievements to the interested readership.

The COCONUT website contains a public area with:

- ✓ News and events
- ✓ Dissemination Activities
- ✓ Public Deliverables
- ✓ Information about the consortium etc

It also contains a restricted area with access only to the COCONUT partners. This area enables the Consortium to manage the diffusion of the information and exchanges between partners and contains a directory with the relevant files of the:

- ✓ Deliverables
- ✓ Milestones
- ✓ Task Detailed Work-Plans
- ✓ Meeting Minutes
- ✓ Project Grant
- ✓ Templates etc

Figure 1: Snapshot of the COCONUT home page.

2.1.1. Statistics

Recently Google Analytics were installed in the project website to monitor the visitors and their demographics. Google Analytics is a popular service that provides powerful digital analytics by generating detailed statistics about a website's traffic and traffic sources.

The COCONUT website is registered to Google analytics service since 30th of April 2014.

Figure 2 presents the total number of users that visited COCONUT's website per day. The red line represents the average number of daily visitors.

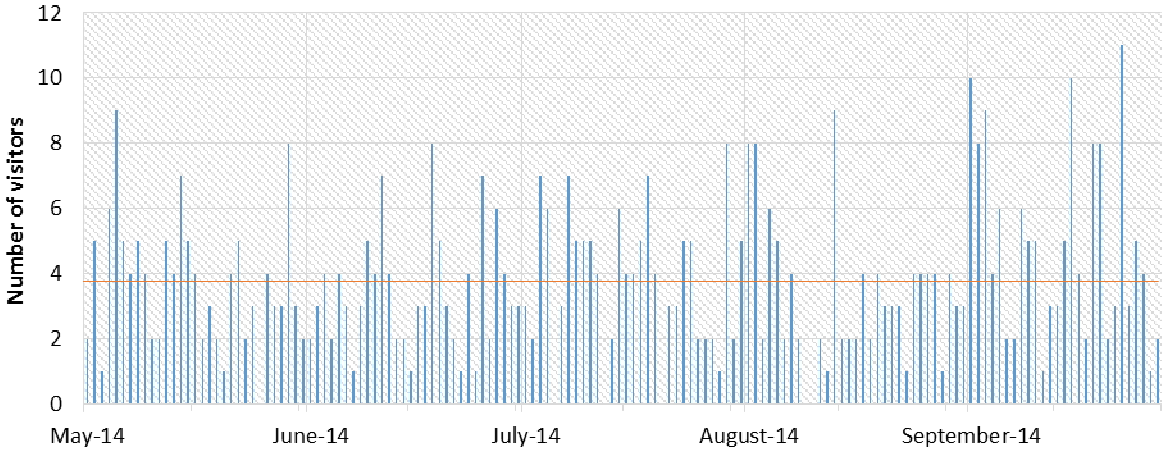

Figure 2: Daily traffic of COCONUT web pages

To understand the behavior of the visiting users, Figure 3 presents the average numbers of pages accessed per session[1] in a daily basis. The red line represents the total average number page views per session. Moreover, Figure 4 presents the frequency distribution of the daily bouncing rates[2] in percentages grouped in steps of ten. This figure is actually an indication of the visitors' interest to the website. Higher rates reflect the intension to exit the website and lower rates the interest to continue accessing more pages.

Figure 5 presents the percentage of the new users to the total visiting users. 45% of visits is related to new visitors, while the other visits are from users who have visited the website more than one times.

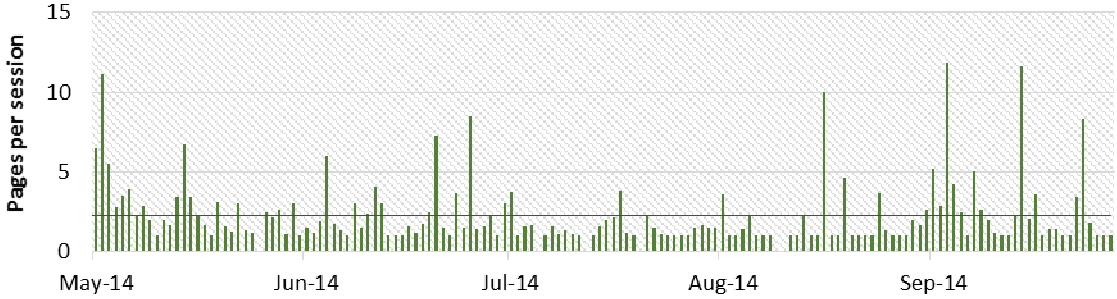

Figure 3: Daily average number of page views per session

[1] A session is determined by a group of interactions that take place on your website within a given time frame. A single user may have different sessions per day, thus the number of visitors may be different to the number of sessions.

[2] Bouncing rate is the percentage of visitors who enter the site and leave the site rather than continue viewing other pages within the same site.

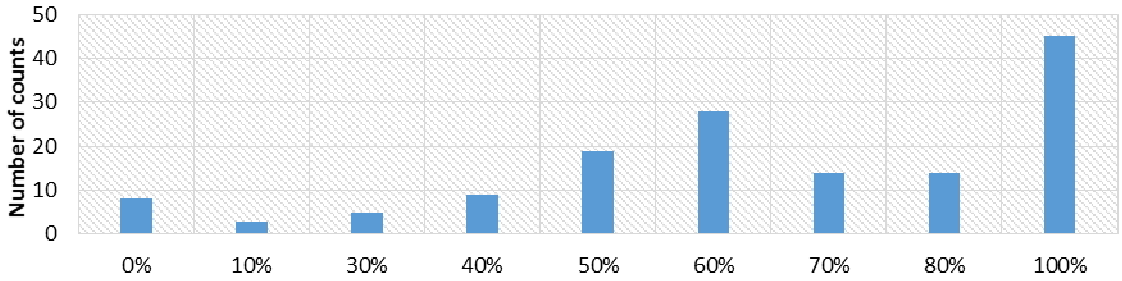

Figure 4: Percentage frequency distribution of the bouncing rates

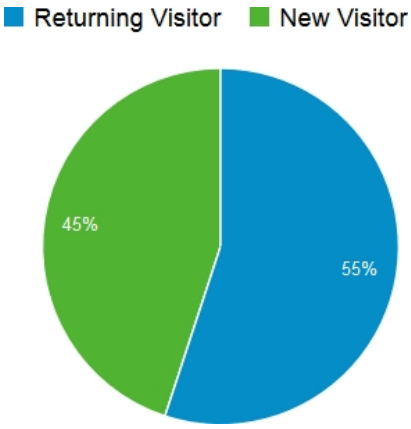

Figure 5: New visitors versus returning visitors

Figure 6 presents the 10 top visitors' origin (Countries). The figure counts only unique users. In total 392 different users were recorded, 273 of which were counted in the top 10 countries.

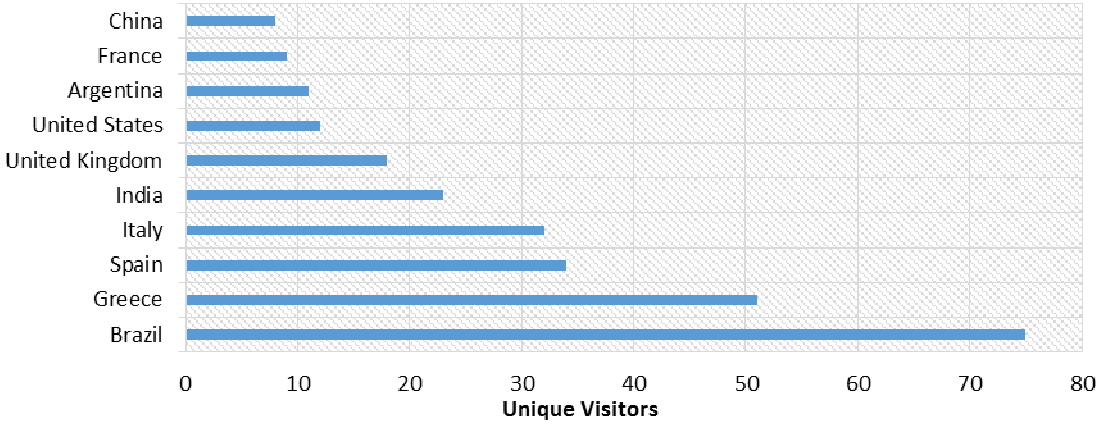

Figure 6: Distribution of Unique visitor in Countries

2.2. Dissemination activities to the scientific community

2.2.1. Publications

2nd Year

During the second year of the project, the consortium has published a total of 25 scientific articles in peer-reviewed international journals and conferences, acknowledging the project.

A list of the publications and submitted papers is provided below:

Journals

1. E. Ciaramella, "Polarization-Independent Receivers for Low-Cost Coherent OOK Systems", Photonics Technology Letters, IEEE, vol. 26, no. 6, pp. 548, 551, Mar 15, 2014.
2. I. Cano, A. Lerín, V.Polo, J. Prat, "Direct Phase Modulation DFBs for Cost-Effective ONU Transmitter in udWDM PONs", Photonics Technology Letters, IEEE, vol. 26, no. 10, May 15, 2014, 973-975.
3. V. Sales, J. Segarra, J. Prat, "An efficient dynamic bandwidth allocation for GPON long-reach extension systems", Optical Switching and Networking, Volume 14, Part 1, August 2014, Pages 69–77.
4. M. Presi, R. Corsini, M. Artiglia, E. Ciaramella, "Using directly modulated DFBs without power penalty in low-cost and high-power budget coherent access networks," Electronics Letters , vol.50, no.7, pp.536,538, March 27 2014
5. M. Presi, M. Artiglia, and E. Ciaramella, "Electrical filter-based and low-complexity DPSK coherent optical receiver," Opt. Lett. 39, 6301-6303 (2014).
6. V. Sales, J. Segarra, V. Polo, J. Prat, "Statistical UDWDM-PONs operating with ONU lasers under limited tunability," accepted in IEEE Photonics Technology Letters.
7. J. Tabares, V.r Polo, I. Cano, and J.Prat, "Automatic λ-Control with Offset Compensation in DFB Intradyne Receiver for udWDM-PON," accepted in IEEE Photonics Technology Letters.

Conferences

1. M. Presi, R. Corsini, and E. Ciaramella, "Experimental demonstration of a novel polarization-independent coherent receiver for PONs," in OFC 2014, paper W4G.3.
2. I. Cano, A. Lerín, V. Polo, and J. Prat, "Simplified Polarization Diversity Heterodyne Receiver for 1.25Gb/s Cost-Effective udWDM-PON," in OFC 2014, paper W4G.3.
3. G. Vall-llosera, E. Ciaramella, "Deployment Scenarios for the COCONUT UDWDM-PON solutions", EUCNC 2014.
4. J. Prat, E. Ciaramella, "Recent advances on the udWDM-PON for lambda-to-the-user access", EUCNC 2014.
5. J. Segarra, V. Sales, V. Polo and J. Prat, "Half-Duplex transmission avoiding Rayleigh Backscattering crosstalk in UDWDM-PON with coherent receivers," in Proc. ICTON'14, Mo.C3.5, Graz, Austria, July 2014.
6. C.N. Ververidis, I. Tomkos, D. Klonidis, A. Rafel, N. Parkin, P. Urban, J. Prat, J. Segarra, "Control and management requirements for a coherent ultra-dense WDM PON for lambda to the user access networks, in Proc. ICTON'14, Graz, Austria, July 2014.

7. J. Segarra, V. Sales, J. Prat and R. Pous, "A new flexible ONU design for UDWDM-PON with coherent transceivers and smart activation process," in Proc. Networks, Funchal, Madeira, Portugal, Sep. 2014.
8. M. Presi E. Ciaramella, "A Full-Duplex, l-to-the-User Bidirectional PON supporting up to 35 dB Optical Distribution Networks Loss", Paper MO.4.1.4, Proceedings of European Conference on Optical Communications, ECOC, 2014, Cannes, (France).
9. R. Corsini, M. Presi, M. Artiglia, E. Ciaramella, "Simple and Low Cost 10 Gb/s Coherent Transmission for Long Reach PON", Paper P.7.3, Proceedings of European Conference on Optical Communications, ECOC, 2014, Cannes, (France).
10. G. Cossu, F. Bottoni, R. Corsini, M. Artiglia, M. Presi, E Ciaramella "High-Power Budget OFDM-PON compatible with Ultra-Narrow Channel Spacing", Paper We.1.6.4, Proceedings of European Conference on Optical Communications, ECOC, 2014, Cannes, (France).
11. A. Lerín, I. Cano, V. Polo, J. Prat, "Polarization independent single-PD coherent ONU receiver with centralized scrambling in udWDM-PONs," ECOC, 2014, Cannes, France, paper P.7.12.
12. I. Cano, A. Lerín, M. Presi, V. Polo, E. Ciaramella, J. Prat, "6.25Gb/s differential duobinary transmission in 2GHz BW limited direct phase modulated DFB for udWDM-PONs," ECOC, 2014, Cannes, France, paper P.7.2.
13. V. Polo, P. Borotau, A. Lerin, J. Prat, "DFB laser reallocation by Thermal Wavelength Control for Statistical udWDM in PONs", ECOC, 2014, Cannes, France, paper P.4.13.
14. G.Y.Chu, V. Polo, A.Lerín, I.N.Cano, J.Prat, "RSOA for UDWDM-PON," to be presented in ACP 2014, Shanghai, China, paper AF2B.5.
15. G.Y.Chu, A.Lerín, I.N.Cano, V.Polo, J.A.Tabares, J.Prat, "Exploiting RSOA for uplink transmission with coherent detection for low cost UDWDM-PON," to be presented in ACP 2014, Shanghai, China, paper AF2B.1.

Invited

1. J. Prat, E. Ciaramella, "Low cost solutions implementing ultra-dense-WDM in access" (Invited) Paper Mo.C3.4, Proceedings of 16th International Conference Transparent Optical Networks, ICTON, 2014, Graz, (Austria).
2. M. Presi, F. Bottoni, R. Corsini, G. Cossu, E. Ciaramella, "Low cost coherent receivers for UD-WDM NRZ systems in access networks" (Invited), Paper Mo.C3.1, Proceedings of 16th International Conference Transparent Optical Networks, ICTON, 2014, Graz, (Austria).
3. I. Cano, A. Lerín, V. Polo, J. Prat, "Direct phase modulation of a DFB laser for udWDM-PON," (invited) in Proc. ICTON'14, Mo.C3.3, Graz, Austria, July 2014.

Submitted

1. Iván N. Cano, Adolfo Lerín, Victor Polo, Josep Prat, "First DQPSK Directly Phase Modulated DFB Based Transmitter for Flexible Coherent udWDM-PONs", submitted to OFC 2015.
2. Vicent Sales, Josep Segarra, Josep Prat, "Operating Statistical UDWDM-PONs with Dynamic Wavelength Assignment", submitted to OFC 2015.
3. Iván N. Cano, Adolfo Lerín, Victor Polo, Josep Prat, "Time Polarization Multiplexing with Centralized OLT Scrambling and Single-PD Heterodyne Rx in UDWDM ONU", submitted to OFC 2015.

4. Josep Prat, “Technologies for a Cost Effective UDWDM-PON”, invited paper submitted to OFC 2015.
5. M.Presi, C. Kazmierski, R. Corsini, S. Faralli, J-G. Provost, R. Brenot, and E. Ciaramella, “70mV (1.4 mA) Peak-to-Peak Drive of 1.25 Gb/s Frequency Modulated Laser for WDM Coherent Access Network”, submitted to OFC 2015.
6. F. Bottoni, M. Presi, M. Artiglia, J. Prat, E. Ciaramella, “Coherent ONU for λ-to-the-user Based on Analogue Processing”, submitted to OFC 2015.
7. M. Presi, R. Corsini, M. Artiglia, F. Bottoni, G. Cossu and E. Ciaramella, “6.25 GHz UDWDM PON based on Directly-Modulated DFBs”, submitted to OFC 2015.

1st Year

During the first year of the project, the consortium had published a total of 5 scientific articles in peer-reviewed international journals and conferences, acknowledging the project.

Journals

1. M. Presi, F. Bottoni, G. Cossu, R. Corsini, E. Ciaramella, "All DFB-based Coherent UDWDM PON with 6.25 GHz Spacing and a > 40 dB Power Budget" , Photonics Technology Letters, IEEE, vol. 26, no. 2, Jan.15, 2014 (accepted within 2013).

Conferences

1. M. Presi, F. Bottoni, G. Cossu, R. Corsini, E. Ciaramella et al., "A 1.25 Gb/s Low-Cost Coherent PON", presented at ECOC 2013, paper We.3.F.
2. A. Lerín, I. N. Cano, Victor Polo, J. Tabares, Josep Prat “Simple ONU Transmitter Based on Direct-Phase Modulated DFB Laser with Heterodyne Detection for udWDM-PON”, Conference Proceedings, ECOC 2013, Paper We.2.F.4.
3. G. Vall-llosera, A. Rafel, E. Ciaramella, J. Prat, "COCONUT requirements for residential, business and outdoor scenarios", ICTON 2013.vol., no., pp.1,4, 23-27 June 2013.

Invited

1. J. Prat, M. Angelou, C. Kazmierski, R. Pous, M. Presi, A. Rafel, G. Vall-llosera, I. Tomkos, E. Ciaramella, "Towards Ultra-Dense Wavelength-to-the-User: The Approach of the COCONUT Project" invited paper at ICTON 2013.
2. G. Vall-llosera, B. Dortschy, P. Urban “Small cell strategy: meeting the indoor challenge” 2014IEEE International Conference on Communications Workshops (ICC), 2014, pp.392-396. Ericsson had an invited talk at the ICC 2014 in Sydney regarding the new developments on radio-over-fibre for the full fiberized Ericsson DOT solution. In the presentation the COCONUT project was introduced and regarded as a candidate solution for small cell backhaul due to the lambda flexibility of the solution, and the ultra-dense grid we are targeting.

2.2.2. Workshops and conference sessions

3-5lab was one of the organizers (C.KAZMIERSKI) of the traditional European Semiconductor Laser Workshop (ESLW2014) held 18-19 September 2014 in Paris prior to ECOC. 3 presentations were made in conjunction with COCONUT objectives:

- G. Y. Chu, A. Lerín, I. N. Cano, V. Polo, R. Brenot, C. Kazmierski, Josep Prat, "Minimizing the Influences of Residual AM Component of RSOA for DPSK UDWDM-PON"
- G. Binet, J. Decobert, N. Lagay, N. Chimot and C. Kazmierski, "AlGaInAs QW Structures Design Investigation for Selective-Area-Growth based Photonic Integrated Circuits"
- G. de Valicourt, C. Kazmierski, J. Decobert, N. Chimot, F. Blache, H. Mardoyan, M. A. Mestre, P. Jennevé, J. C. Antona, S. Bigo, O. Bertran-Pardo, "Integrated transmitters for cost-sensitive networks"

BT participated in a workshop at OFC 2014 where the COCONUT Project was presented addressing its relation with Standardisation efforts according to BT's views on Research and access PON technologies.

- Workshop M1B "Just How Many Versions of Standards-based PON Systems Does the Industry Need?", organised by Denis Khotimsky, Verizon, US, and Fabrice Bourgart (France Telecom, France)
    - BT presentation: "EU FP7 COCONUT Project", Albert Rafel

AIT organised an open international workshop (AIT premises, May 9th 2014) under the auspices of COCONUT and other EU projects. The title of the one-day workshop is "Optical Communication Systems and Networks: From Data Centers to Broadband Access to Core Transport Networks". This workshop brought together academia, industry, entrepreneurs and funding agencies working on telecommunications networks with an emphasis on optical communication systems and networks. Speakers from universities and research centers, companies, as well as the head of sector "Internet of Things and Optical Networks", European Commission were invited. Prof. Ernesto Ciaramella (**SSSA**) and prof. Josep Prat (**UPC**) were invited to present their views with the following talks:

- Josep prat, "Next Generation Broadband Optical Access Networks"
- Ernesto Ciaramella, "How R&D activities between a major Company and a University Lab can successfully flourish: the Pisa example of SSSA and Ericsson".

3. Exploitation Activities and Plans

The following section describes the exploitation plans and activities per consortium partner. The plan of each partner for the exploitation of the COCONUT results was reported in detail in the COCONUT DoW. Following the end of the 2nd reporting period in M24 this deliverable summarizes the up-to-date status and any performed activities.

3.1. Patent Applications and Innovations

Although COCONUT just completed its second year, 2 inventions developed within COCONUT have shown substantial innovation to be protected by a patent. 2 applications/proposals are now in progress.

SSA
Inventor: E. Ciaramella, M. Presi

Title: "Independent Polarization Coherent Receivers"
Status: Patent filed to Italian Patent Office, international extension in progress.
Main Idea: Exploiting the 3rd input of a 3x3 coupler in a phase diversity receiver to achieve polarization independency.

35L
Inventors: C.Kazmierski, A.Garreau
Title: “Integrated semi-conductor IQ modulator and transmitter without phase modulation and control”
Status: Submitted 18/02/2014 to French Patent Office N° 14305227.2, under exams for extensions over EU (EP 14 3052 27) and world.

3.2. Exploitation plans per industrial partner

3.2.1. BT

BT expects some technologies that are being studied within the COCONUT project to be useful in PON system technologies over legacy fibre infrastructure and to achieve larger loss budgets. In order to achieve this goal, simplified coherent based transceivers would be used at both ends of the fibre access network, i.e. at the ONU on the customer side, and at the OLT on the network side.
Larger loss budgets would allow BT to offer high bandwidth services to more customers than the current PON technologies allow, both within the legacy commercial deployments footprint, and in new, more rural areas where current technologies are unable to offer the same level of services as in urban areas.
The possibility of offering point to point wavelength services, also opens the opportunity to use the same PON technology to connect business customers as well as backhaul and fronthaul. The latter connectivity service is foreseen to become very important for the advanced 4G mobile networks, where a large number of small cells need to be interconnected to a Base Station for coordinating the remote nodes and running the network protocol.
The studies on coherent technologies for both the ONUs and the OLTs, which are being addressed within the COCONUT Project are showing promising initial results both on performance and reduced cost. If these initial results can be confirmed during the final year of the project, it could open the possibility to incorporate them in the NG-PON2 systems if accepted by the Standards community and incorporated into existing ITU Recommendations.
On the other hand, it could also mean that the COCONUT concept could be a strong candidate for a future generation of PON systems.
Pending the results of the studies of the final year, BT would work towards promoting the COCONUT concepts among the wider research and commercial communities in the access space.

3.2.2. ERICSSON

A networked society is the vision of what will happen when everything that can benefit from being connected will be connected. In this networked society there is an unconstrained access to data, i.e. sharing data anywhere and at any time by anyone. In this manner, the first steps towards enabling a networked society have been taken: a) increasing network performance, b) network densification, and c) addition of small cells. Providing ‘data-rate’ coverage will be

the key challenge to deliver a consistent quality of service of mobile broadband to users and connected devices.
Once 'data-rate' coverage has been achieved in the wireless access network, it is up to the transport network to backhaul the data traffic. The first and most cost-efficient option for backhaul is to reuse the present infrastructure. The options that are currently deployed and or studied consist of wireless line-of-sight (LOS), wireless non-line-of-sight (NLOS) and wire line. Wire line includes copper, fibre-to-the curb, fibre-to-the-building, and fibre-to-the-home when available. The Gbit/s performing DSL link, G.fast, decays to 100 Mbit/s after 500m, thus, link lengths are the limiting factor for mobile broadband backhaul with copper cables. The best performing solution in terms of distance and capacity is fibre optics, simply because the optical carrier frequencies are typically ca 200 THz in contrast with microwave frequencies of 1 GHz, and if we consider e.g. 1% as the limiting value for the bandwidth of the modulated carrier then optical communication systems have the potential of carrying information at Tbit/s speeds.

The COCONUT approach consists of a new generation of optical access networks that is directly implementable over the existing fibre-based access network infrastructure, it targets low-cost coherent transceivers capable of 1.25Gbit/s data rates per antenna and wavelength, using 6.25 GHz spacing of the DWDM (Dense Wavelength Division Multiplexing) grid. Because of that it makes COCONUT a candidate solution for small cell backhaul and to enable ultra dense deployments as predicted by Baldemair et al. [R. Baldemair, et al., "Evolving wireless communications: Addressing the challenges and expectations of the future", IEEE Vehicular Technology Magazine, vol.8 , no.1 , 2013, pp. 24-30].

3.2.3. OPTRONICS

OPTRONICS expects to gain valuable exposure in the technologies to be developed within the project such as the novel coherent systems and their application in the future access networks. Through the results of the project, the company expects to be able to expand and address new markets where combination of the current know-how will be complemented by the project innovations. Indeed OPTRONICS is renowned in Greece for its expertise in the deployment of optical networks (having designed, managed, constructed and commissioned networks consisting of thousands of kilometres of fibre including two FTTH pilot projects). Due to this corporate activity it is crucial to be involved in the development of such a cost-effective PON solution as part of the OPTRONICS business development strategy.

OPTRONICS has identified the deployment and service application scenarios that are of interest to the company. Purely green-field deployment is the case that interests more OPTRONICS due to the limited fiber access penetration in its target markets (SE Europe). Considering the current 4G expansion, mobile backhauling is the most promising service application scenario. It is also expected that the benefits of the COCONUT architecture in terms of cost and performance will allow it to be easily adopted and incorporated in complete system solutions for residential customers (including small businesses). Standardization shall become critical in the commercialization roadmap of the COCONUT architecture.

3.2.4. PROMAX

PROMAX Electrónica, as a telecommunication's equipment development company, produce a wide range of products that include, among others, analysers to control the quality of signal reception in optical networks. Therefore we expect to develop a cost-effective portable High Resolution Optical Spectrum Analyser for the FTTH market.

During the second year of activity, PROMAX has tested and validated different technologies in order to design the most competitive HR-OSA. By designing solutions with tuneable lasers and coherent detectors, we have achieved important advances such as: (1) wide knowledge about the state of art of lasers, optical components (switches, polarizers, filters, lens, diffractors and photo detectors) and micro- and nano- mechanical elements; (2) coherent system characterization with lasers; (3) software design for laser's and micro-mechanical devices' control.

Furthermore, we expect this project will conclude with a wavelength monitoring system based on the HR-OSA, which will improve our leadership in the world's optical test equipment market.

Although developments are still ongoing, the foreground is enabling an important progress in other optical developments carried out by the company.

Moreover, PROMAX has come into contact with a possible client interested in a HR-OSA for a test in its FTTH's network.

3.2.5. 35L

We expect this work will allow multilevel modulation migration towards low cost applications such as in the customer Optical Network Unit (ONU) in PONs and in short reach data links. There is also a strong corporate business interest in very high bit rate data-communications and short reach. These applications require often phase modulated components in order to completely or partially remove transmission distance impairments due to a fibre dispersion by a coherent detection. We might expect that system experimentation results would certainly trigger a consolidated industrial interest required for further optimizations.

Component expertise and prototypes will be delivered to corporate equipment development studies. We expect that elaborated COCONUT knowledge will eventually allow to select most industrially interesting solutions providing more impact on exploitation of results. In a case of business interest in large component quantities we will target a technology transfer to an industrial partner.

In addition to the corporate business exploitation plans, this work will also be exploited to validate and stabilize a new Photonic Circuit Integration technology on InP together with a new concept of components having "more functionality with fewer electrodes" expected to improve chip size/power/speed while preserving low cost potential. The generated knowledge and its dissemination is a mandatory step for further industrializations. To this aim, we specially focus on innovation and patenting as a tool for further results exploitation.

4. STANDARDISATION EFFORTS

4.1. Current Situation – Year 2

The COCONUT approach covers solutions for the next generation optical access. This indicates the relevance of fora and standardization groups that deal with the definition of the next generation PON such as FSAN, IEEE and ITU-T. IEEE 802.3 finalized the 802.3av 10Gbps EPON specification in September 2009 and are currently in the process of studying the possibility to start an activity towards defining a Next Generation EPON technology with higher capacities in the last mile. ITU-T's next generation standard following on from G-PON is the G.987 for 10G-PON also known as XG-PON.

More recently, in search for a more flexible and scalable solution, the FSAN Group has focused on a future fibre access generation (termed NG-PON2). FSAN's NGPON2 activity has been dedicated to the next generation access after 10Gbps PONs. Although FSAN is not a standards definition body, their output is submitted to ITU-T Study Group Q2/15 ("Optical systems for fibre access networks") to facilitate the development of global PON standards. The first result has been the description of the drivers and requirements that any candidate PON system needs to meet. There have been a number of proposals under discussion as candidates to become a standard with the FSAN support with a timeframe around 2015.

In early 2012 the operators in FSAN have decided to select TWDM with OOK modulation (40Gbit-capable PON) as the primary solution for NGPON2. DWDM-PON (ptp via DWDM over a PON ODN) has been accepted as an optional overlay.

Currently, the standardization activities of the NG-PON2 system are defined in the Recommendation ITU-T G.989 series and the status is as follows:

- Recommendation ITU-T G.989 : Definitions and conventions
- Recommendation ITU-T G.989.1: General requirements
- Recommendation ITU-T G.989.2: Physical media dependent (PMD) layer specification (Consented in December 2013 – under approval process). *"Recommendation ITU-T G.989.2 describes a flexible optical fibre access network capable of supporting the bandwidth requirements of mobile backhaul, business and residential services. The G.989 series of standards allows for multiple upstream and downstream line rates. This recommendation defines passive optical networks with an aggregate bandwidth of nominally 40 Gbit/s in the downstream direction and 10 up to 40 Gbit/s in the upstream direction, hereinafter referred to as NG-PON2"* (from the summary of recommendation ITU-T G.989.2 currently under study).
- Recommendation ITU-T G.989.3: Transmission convergence (TC) layer specification (draft in progress)
    - Based on G.987.3, with wavelength control and 10G upstream added
- Recommendation ITU-T G.multi = Wavelength control layer (draft in progress)
    - Meant as a general framework for TWDM-systems, of which G.989 is one
- Recommendation ITU-T G.984.5 = Wavelength coexistence (Consented April 2014 – under approval process)
- Recommendation ITU-T G.988 = ONU management and control interface
- Standard in force, can be easily reused for TWDM

Nonetheless, the comprehensive architecture of COCONUT is not competing as an alternative to NGPON2 (very short-term solution) but rather aspires to influence the definition of NGPON3.

4.2. Course of Action

When a suitable solution can be identified in the COCONUT activities, it can be proposed and discussed within the FSAN Group where BT currently holds the position of co-chair of the NGPON Task Group.
Once the solution has been discussed and agreed within the FSAN Group, the next step would be to bring it to the ITU-T for standardisation.
The innovations that the work in COCONUT could bring about, would be applied either to enhance certain features of the NG-PON2 solution currently being defined in FSAN/ITU or for a future system (NG-PON3).

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