2020 LCA Annual Report

The Light Communication Alliance (LCA) (http://lightcommunications.org/) represents a groupment of Industrials (operators, constructor of equipments, component makers), Research Institutes, and Universities. Its motivation is:
Delivering the benefits of ubiquitous Light Communications to serve people & technologies, requires a far-reaching & coherent ecosystem working at a determined pace.
This LCA was officially launched in June 2029 (https://www.linkedin.com/feed/update/urn:li:activity:6549301446368645).
The missions of the LCA are: Driving a consistent, focused & concise approach to market education that will highlight the benefits, use cases & timelines for Light Communications.
To reach this mission the objective is to align leaders across every industry to develop or envisage business models using Light Communication systems & technologies by defining a standard of education in an efficient communication & co-operation frame.
We can found the background of the foundation period at : https://futurenetworks.ieee.org/tech-focus/may-2018/light-communications-for-wireless-local-area-networking

History

ZERO1, headquartered in Luxembourg, was approached by the Luxembourg government in 2018 to participate in various events to present OCC and LiFi technologies. Marc Fleschen also joined the Luxembourg working group on 5G.

The prospect of LCA as a new international organisation bringing together major players in technology and industry has convinced government authorities to support us.

Mr. Eric Krier, Minister of State in charge of media and communication of the Grand Duchy of Luxembourg, actively participated from the first founding work of the Alliance and provided a letter of support from Prime Minister Mr. Xavier Bettel.
The choice of LCA's headquarters was also motivated by Luxembourg's position and its proximity to European authorities.

Membership

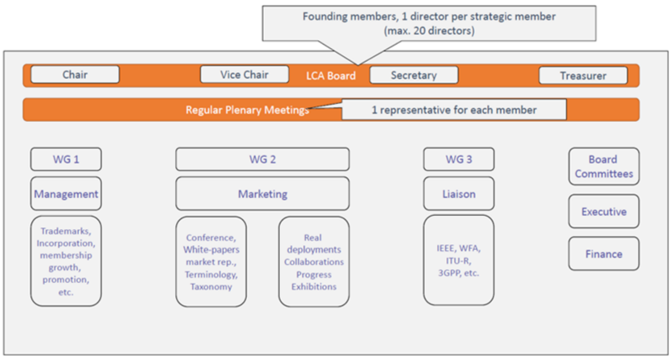
The membership is opened to any company having an interest in Light Communication technologies. A member can be an industrial company (equipment vendor, technology developer, software vendors, operators…) or a research institute/university.

The members are asked to provide consistent messaging of the LCA and contribute during the regular meetings to provide inputs. In return, the members can help advise the LCA on the need to support specific scientific/technical projects, or in terms of partnership to address a specific topic in line with the objectives of the LCA.

For the first year, 18 companies joined the LCA and are split into six categories:

1. LiFi key players
2. Applications
3. Operators
4. Equipment vendors
5. Networking and security
6. University/Research institute

Structure of the LCA



The activity of the LCA is split into three working groups:

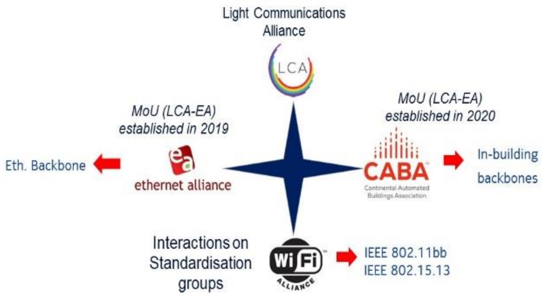
- WG1: Management. The objective of this working group is to address the administrative parts of the LCA, to manage memberships, information management, offer document sharing facilities and identify actions relevant to accelerate the promotion of the LCA.
- WG2: Marketing. The objective of this working group is:
    - address the participation in conferences, identify white papers when relevant, define key messages and propose white papers, or any marketing support.
    - boost internal actions through new initiatives and projects through reinforced relations between members. evangelize the use case roadmap, design and realize an LCA booth for conferences.
- WG3: Standardization and Liaisons. The objective of this working group is to report on the latest progress in the relevant standardization bodies, facilitate the establishment of new collaborations with other industrial Alliances that are of interest for the LCA and recommend the LCA vision and position impacting the emerging standards.

Associated Alliances

The Light Communication Alliance has reinforced its position through strategic collaborations with other Industrial Alliances: the Ethernet Alliance and CABA (Continental Automated Building Association).

- The Wi-Fi Alliance Board of Directors are regularly informed of the progress of the LCA and creates the fundamental links for key standards – an enabler for the mass market deployment of LC.

- The Ethernet Alliance is strategically relevant to address the backhaul considerations of LC and ensure that future systems can support emerging LC capabilities.
- The CABA Alliance addresses the interconnection for in-building deployments of various technologies.



Technology focus

The LCA is focused on three technologies: Optical Camera Communication (OCC) technology, Light Fidelity (LiFi) technology and Free Space Optics (FSO) technology.

- The OCC technology describes a unidirectional technology exploiting the camera as a photodetector associated with an application able to interpret the information received to be easily exploited by the user through a graphic interface. The light signal is in the visible domain for classical cameras (not IR cameras). The bit rate is limited to the potential of the camera technology.

- LiFi technology is a bidirectional technology requiring an additional physical layer (transponder including LED(s) and Photodetector(s)) and in some versions a new data link layer (new MAC layer). The spectrum exploited for this technology includes the visible spectrum (350 nm – 700 nm), but also the IR spectrum (800 – 1000 nm). Typically, IR is used for the upstream traffic. For the downstream traffic, either visible light or IR light can be used depending on the use case. The technology delivers a user experience substantially similar to Wi-Fi except using the light spectrum, offering high data rate, mobility, handover and more.

- FSO technology describes a bidirectional wireless optical communication system, currently used for the backhauling in outdoor, but also has potential for in-door applications for high bit rate connections, with no requirement for mobility. The spectrum exploited is between 950 nm and 1550 nm. One advantage of this technology is its capability to offer a high bit rate wireless connection with a collimated optical beam to improve security and continuity in the data transmission.

Market perspectives

For the time line identification, a proposal revisited with respect to the roadmap identified before 2020 to take into account the worldwide sanitary crisis, leading to the following conclusions:

- For short term markets (2020 – 2021 and beyond), the deployment could be focused on fixed data communication (no mobility), introducing the unidirectional (OCC) and Bi-directional (LiFi based on the IEEE 802.11bb standard).

- For Medium term markets (2022– 2025 and beyond), the deployment of fixed position and indoor positioning in complementary with a reinforced deployment of the LiFi technology. First mobility functionalities could be introduced in this second phase.

- For Long term markets (2025 and beyond): the complementary deployment of fixed/mobile LiFi and indoor positioning and the introduction of FSO for in-door applications.

Standardization status

The year 2020 has been very active in terms of light communication (LC) standardization, and although the LCA is not directly involved in this process, several of its members took an active part in it. Two major organizations are currently working on LC standards: the IEEE and the ITU-T.

On the IEEE side, two main standards are being developed: the IEEE 802.15.13 and the IEEE802.11bb. After three years of work, a comprehensive IEEE 802.15.13 draft was finalized in October 2020 and submitted for a first Standard Association ballot, which approved it in December 2020. The working group is now addressing the received comments and will then submit the draft to new ballots, leading eventually to the standard publication by September 2021. From a more technical point of view, the IEEE 802.15.13 targets multi-gigabit LC with data rates up to 10 Gbps, over distances in the range of 200 m, and for wavelengths from 10,000 nm to 190 nm. It defines three PHYs – a low-bandwidth OFDM PHY for operation below 100 Mbps, a high bandwidth OFDM PHY for operation up to 10 Gbps and a pulsed modulation PHY for low power operation up to 100 Mbps – and two sub-MAC layers designed for point-to-point and point-to-multipoint communications in non-coordinated and coordinated topologies with handover support. Eventually, this standard is intended for Industry 4.0 and enterprise use cases, but also for small cell backhaul and automated guided vehicles.

Work on the IEEE 802.11bb standard started in 2018, within the 802.11 working group, known in particular for its Wi-Fi standards. The main goal of 802.11bb is to take over these Wi-Fi standards and to introduce the necessary changes so that they support LiFi with speeds between 10 Mbps and 5 Gbps. This standard would thus address the needs of the mass market (smartphone in particular) by using Wi-Fi chipset jointly for Wi-Fi and LiFi. At the same time, it would allow LiFi to enter the 5G framework via the non-3GPP interworking function mechanism. During the year 2020, the 802.11bb task group focused his work on the PHY definition and agreed on three different modes: an 11a PHY used as common mandatory mode, an 11ax PHY used as an optional high-efficiency LC mode, and a G.9991 PHY used as optimized LC mode. It also agreed on a common wavelength range of 800 to 1000 nm and on the bandwidth and channelization. The group is now addressing comments to the working draft while reviewing contributions for the MAC layer definition and is on track to produce a first stable technical draft in July 2021.

On the ITU-T side, LC standardization is carried out by the Q18/SG15 group, which previously published the G.hn set of recommendations for home networking via phone wiring, coaxial cables, power lines and plastic optical fiber. The G.9991 recommendation was then published in 2019 for high speed LC operating at up to 2 Gbps. As it is greatly inspired from the G.hn recommendations, G.9991 is currently the only existing LC standard that benefits from existing chipsets, which is why several LiFi vendors, some of which are part of the LCA, have put on the market

G.9991-based products. During the year 2020, the Q18/SG15 group focused its work on improving the G.9991 recommendations by first including an IEEE 802.1x network access control mechanism for enhanced LC network security, which was approved in July 2020. In parallel, an advanced interference handling and handover mechanism has been discussed to enable seamless user mobility support. It is now being integrated into the G.9991 recommendations and should be published early 2021.

Words of the LCA Chairman

It is with humility and pride that as the Chairman of the Light Communications Alliance I would like to introduce this first ever annual report.

2020 has been the founding year for the Alliance but also a challenging year for everyone. In December 2019, our members could participate freely in face-to-face meetings with a two-days event to kick-off our Alliance in Luxembourg at the European convention center in conjunction with the launch of the 5G Luxembourg forum. We anticipated a similar year with frequent face to face interactions, unfortunately, a few weeks later we discovered what the future held for us. During this distressing period, despite all the difficulties of each member, we managed to register and formalize what was just an idea, the Light Communications Alliance. Officially registered in February 2020 the Light Communications Alliance was born. But the year 2020 was going to be one of the most challenging one that our modern society had to face. The SARS-CoV-2pandemic made physical meetings something from the past. Face-to-face interactions became rapidly impossible and travel became a faded dream. Despite these challenges, the spirit, the idea, and the motivation of our members were unshaken, becoming stronger and more resilient than ever.

In this founding year, despite unprecedented challenges the resilience of our members led to a strong and bright future for the LCA. Through monthly and quarterly Video conferencing meetings we have made the Alliance fully operational with registration finalization, bank account opening with full financial capability, new members onboarding and strategy setting for the coming years. The Alliance is more than spreadsheets and PowerPoint presentations, it's a human adventure led by a group of passionate people who believe in a simple yet intriguing idea to make a better world for the generations to come. How? By making a new sustainable and secure layer of communication fulfilling the dream of light speed internet access. This year also showed us how fragile we can be as human beings and how important cyber security and healthcare are. Those priorities became also dedicated uses cases where we saw Light Communications offering significant benefits.

I would like also to finish by thanking the executive board of the LCA for their work, their dedication, their advice and their support: I namely thank Nikola Serafimovski, (pureLiFi) Dominique Chiaroni (Nokia) and Enrique Poves. (University of Strathclyde) This passion we share, the idea we believe in led to this annual report of year 1 of the Light Communications Alliance and many more years yet to come. I also want to thank all our members who joined us during this difficult year:

Micheline Perrufel and Sylvain Leroux from Orange who initiated the very first LiFi forum back in 2017 in Chatillon France. Peter Fischer (BKS), Dimitri Ktenas and Luc Maret (CEA Leti), Jose Tabu (Crantec), Fathi Abdeldayem (Emirates Integrated Telecommunications Company - du), Stephen Davis, Daniel Lin and YC Chang (Getac), Catherine Lepers and Franck Gillet (Institut Mines-Telecom), Simon Clement (Liberty Global), Daniel Baussou and Eric Deblonde (Lucibel), Hardik Soni (NavTechno), Bela Berde, Chung-Shue Chen, Jos George and Maximilian Riegel (Nokia Bell Labs,) Benjamin Azoulay and Bastien Bechadergue (Oledcomm), Sarah Scace (pureLiFi), Stiepan A. Kovac (QR Crypto), Musa Unmehopa (Signify), Prof. Harald Haas (the LiFi Research & Development Centre with University of Strathclyde), and Deepak Solanki (Velmenni).
Another year is ahead of us filled with new opportunities.

Chairman of the Light Communications Alliance