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10 Gbit/s over traditional copper telephone lines

Copper network operators complement a Fiber-to-the-Home (FTTH) strategy with a hybrid fiber-copper deployment in which fiber is gradually brought closer to the consumer, while Digital Subscriber Line (DSL) technology is used for the shortened copper drop. Such hybrid network provides a fast and sustainable way to achieve nationwide coverage of ultra-broadband services. This year, the industry achieved the following two milestones to satisfy ever increasing data rate requirements: (1) the first deployment of G.fast has been announced. G.fast is a recent ITU-T standard enabling 1 Gbit/s connection speeds. (2) Bell Labs demonstrated XG-FAST, a technology capable of delivering 10 Gbit/s connection speeds over short copper pairs.

With a hardware proof-of-concept platform, multi-gigabit data transfer is shown over typical drop lengths from front yard to customer premises equipment of up to 70 m. When an additional pair is available, 10 Gbit/s service is shown to be possible up to 30 m by exploiting bonding and phantom mode. The XG-FAST technology will make Fiber-to-the-Door deployments feasible, which avoids many of the hurdles accompanying a traditional FTTH roll-out. Single subscriber XG-FAST devices would be an integral component of FTTH deployments and help accelerate a worldwide roll-out of FTTH services.

[1] W. Coomans, et al., 'XG-FAST: Towards 10 Gb/s Copper Access', Proc. of IEEE Globecom, Dec. 2014.

Software Defined Networking (SDN) for wired-wireless integration

Future 5G mobile and wireless Local Area Networks (LANs) systems are driving the redesign of control solutions enabling effective wired-wireless integration. In future 5G mobile systems, the wireless network side will experience increased traffic volumes, higher data transmission rates and the emergence of new services based on cloud applications. This translates into the need to have an integrated, flexible and programmable backhaul/fronthaul segment able to guarantee the necessary adaptability to service requirements and traffic conditions. In LANs, wireless is becoming the primary access method. In this case, enhancements in network throughput have to be combined with better agility and flexibility, aiming at providing the same responsiveness and service level as wired connections.

Software Defined Networking (SDN) represents a suitable candidate technology able to provide a combined management of the wireless and wired segment. A single SDN Controller/Orchestrator, equipped with different and technological-specific southbound interfaces, is expected to provide a common view and control of the wired-wireless network. SDN solutions for mobile/backhaul/ /fronthaul access segment are expected to simplify network operations, lower total cost of ownership, and rely on manual-free operations. Similarly, SDN orchestration in Wi-Fi and wired LANs is expected to simplify management functionalities and policy

enforcement strategies that nowadays are still handled separately. Network programmability and Network Function Virtualization (NFV) are expected to be applied to dynamically react to application and business needs in a coordinated way, and to also provide performance improvements. For example, network throughput can be improved when users are located in overlapped service areas by enabling advanced programmability of migration and handoff strategies. Moreover, download rates can be increased by activating multiple parallel streams originated in the wired network and delivered, in a coordinated and synchronized way, by the wireless network.

For the latest advances on this topic, we recommend: "Software Defined and Virtualized Wireless Access" ComSoc Researc Group
http://community.comsoc.org/groups/rg-software-defined-and-virtualized-wireless-access

Visible Light Communication (VLC)

Light Emitting Diodes (LEDs) are becoming the preferred source for lighting, since they have higher energy efficiency, lower voltage, longer lifetime than conventional illumination sources. Furthermore, LEDs can be directly modulated and work as optical wireless transmitters. This emerging technology, known as Visible Light Communication (VLC), is particularly suitable for both illumination and communication needs in indoor environments.

To achieve high transmission rates with low-cost LEDs, Discrete Multi-Tone (DMT) modulation is typically adopted. The key feature of DMT is that it exploits orthogonal multiple subcarriers, adaptively loaded with multilevel modulation. Furthermore, the possibility to dynamically allocate the number of bits per subcarrier according to its signal-to-noise ratio, enables the maximization of the link capacity. This technique allows overcoming the frequency limitation of the channel, hence reaching bit rates up to Gbit/s.
In common indoor scenarios, more than 200 Mbit/s for both downlink and uplink was obtained at 2 m Tx-Rx distance, with a served hot spot area of 12 m^2. When careful Tx-Rx alignment and tracking system are introduced, a 1.6 Gbit/s bidirectional high-speed transmission can be achieved. Finally, exploiting wavelength division multiplexing (WDM) in multiple-chips LEDs (e.g. RGB), 5.5 Gbit/s has been recently demonstrated in [2]. In all cases, the illumination at the receiver was at typical level for common working environments.

[2] G. Cossu, R. Corsini, E Ciaramella, "5.6Gb/s Downlink and 1.5Gb/s Uplink Optical Wireless Transmission at Indoor Distances (> 1.5 m)", ECOC Conf., 2014

Accreditation News

The IEEE ComSoc's Telecommunications Engineering Education (TEE) movement, which has been led by TAOS Chair Tarek S. El-Bawab for several years, has culminated in adopting their proposed telecommunication engineering accreditation criteria by ABET (Accreditation Board for Engineering and Technology). For more information, please refer to:

http://theinstitute.ieee.org/career-and-education/university-education/telecommunications-engineering-is-now-a-distinct-education-discipline

http://www.comsoc.org/blog/breaking-news-telecommunication-engineering-now-official-accreditation-criteria

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