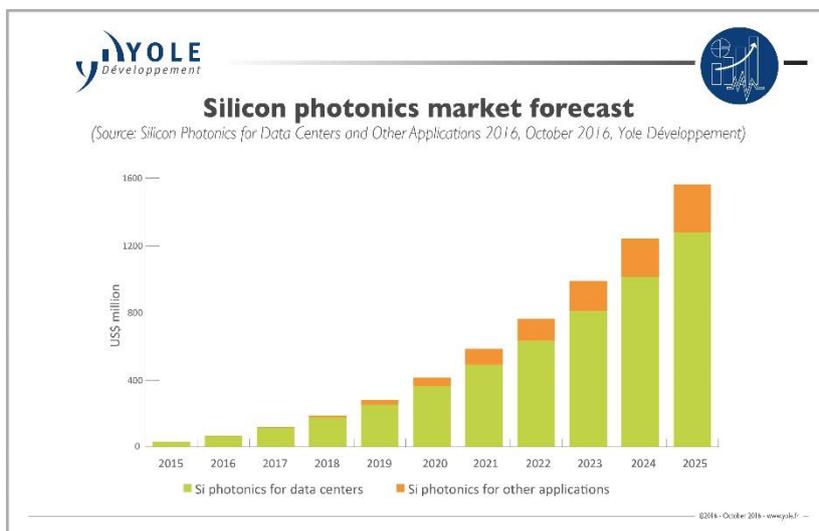


The silicon photonics industry is ready for take-off. Objective: a multibillion dollar market.

Silicon Photonics for Data Centers and Other Applications report – Oct. 2016

LYON, France – November 8, 2016: *Datacenters with few other emerging applications will become a multibillion dollar market for silicon photonics by 2025. Transporting high level of data with existing technologies will soon reach its limit and photons will continue replacing step by step electrons throughout networks. Growing investments made by VCs have been identified by Yole Développements’ analysts and few startups have been created in this sector. All these indicators confirm the trend: silicon photonic technologies have reached the tipping point that precedes massive growth...* [Yole Développement \(Yole\)](#), the « More than Moore » market research and strategy consulting company releases this month the technology & market analysis titled [Silicon Photonics for datacenters and other applications](#). Both experts **Dr Eric Mounier, Sr Technnology & Market Analyst at Yole** and **Jean-Louis Malinge, former CEO of Kotura, now at ARCH Venture Partners** combined their knowledge of the silicon photonic industry to perform a deep added-value analysis. Under this report, they examine the current status and future challenges for silicon photonics and data centers application. They detail for all applications, silicon photonic benefits as well as a comprehensive analysis of the industrial supply chain with player’s status.

What is the status of silicon photonic technologies? Could we already speak about commercial solutions? What is the market size today? What about tomorrow? How high are the current investments?... Yole’s analysts offer you a snapshot of the story.



The silicon photonics market is still modest with estimated sales below US\$40 million in 2015 and very few companies actually shipping products in the open market: Mellanox, Cisco, Luxtera, Intel, STMicroelectronics, Acacia and Molex are part of these leading players.

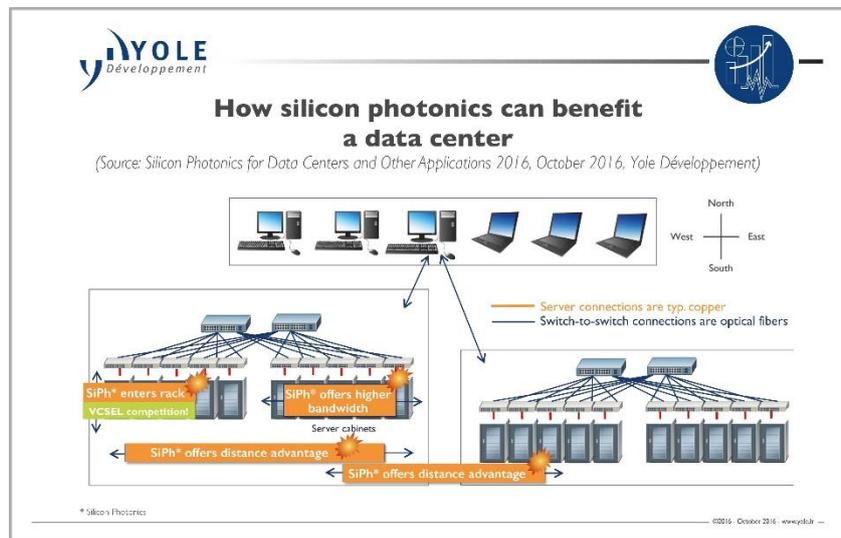
Silicon photonics has been under development for years. However now, this technology is being pushed hard by large webcom companies like

Facebook and Microsoft. “Silicon photonics has reached the tipping point that precedes massive growth”, comments Dr Eric Mounier from Yole. “Indeed we estimate, the packaged silicon photonics transceiver market will be worth US\$6 billion in 10 years.”

Silicon photonics is an exciting technology mixing optics, CMOS¹ technology and advanced packaging. This combination benefits from semiconductor wafer manufacturing scalability to reduce costs.

“Silicon photonics offers silicon technology advantages including higher integration, more functionalities embedded with lower power consumption and better reliability compared to legacy optics”, analyzes Jean-Louis Malinge.

In 2020 and more, silicon photonic chips will far exceed copper cabling capabilities. Such solutions will be so deployed in high-speed signal transmission systems. In 2025 and more, the technology will be more and more used in processing such as interconnecting multiple cores with processor chips. Indeed, according to Yole’s analysts, the chip market value should score US\$1,5 billion in 2025 at chip level (Estimated to be less than US\$40 million in 2015). Step by step photons get closer to the chips!



Data centers are clearly the best opportunity for silicon photonics technology today. And there are also many other applications that silicon photonics can enable. These include high performance computers, telecommunications, sensors, life science, quantum computers and other high-end applications.

Two applications are particularly interesting as silicon photonics can push the integration of optical functions and miniaturization further to achieve successful products. Those applications are lidars for autonomous cars and biochemical and chemical sensors.

¹ CMOS: Complementary Metal Oxide Semiconductor

Lidars are costly and bulky instruments which make their integration in a car challenging. Within a promising ADAS² market expected to reach US\$3,9 billion in 2017³ silicon photonic-based lidar will play a key role. Indeed silicon photonics allow lidar without moving elements, which can experience issues in a harsh car environment. Last august, MIT's Photonic Microsystems Group announced a successful DARPA project using silicon photonics for lidar-on-a-chip with steerable transmitting and receiving phased arrays and on-chip Ge⁴ photodetectors.

Biochemical and gas sensors are not new, and several applications have existed for a while. Day by day, the interest in gas sensing is gaining importance due to the emergence of promising new large volume portable applications. Integration of biochemical or gas sensors into smartphones or wearables is currently on the roadmap of many companies but size, cost and sensitivity are still issues. To push optical gas sensor miniaturization further, some companies are already considering silicon photonics as an integration platform for their devices.

These non-data center applications will be about US\$300 million in 2025, detail Yole's analysts in the silicon photonics report.

A detailed description of the report [Silicon Photonics for Data Centers & Other Applications](#) is available on i-micronews.com, photonics reports section.

² ADAS : Advanced Driver Assistance System

³ Source: [Sensors and Data Management for Autonomous Vehicles report 2015](#) – Yole Développement, October 2015

⁴ Ge : Germanium



About [Silicon Photonics for Data Centers and Other Applications 2016](#) report

Have we reached the tipping point before silicon photonics grows massively in data centers?

- About the authors:

Dr. Eric Mounier has a PhD in microelectronics from the INPG in Grenoble. He previously worked at CEA LETI R&D lab in Grenoble, France in the marketing dept. In 1998 he cofounded Yole Développement, a market research company based in France. Eric is Principal Analyst at Yole, in charge of market analysis for MEMS and Sensors, visible and infrared imagers, including CMOS image sensors and microbolometers, semiconductors, printed electronics and photonics, including silicon photonics. He has contributed to more than 200 marketing and technological analyses and 100 reports. Eric is also an expert at the OMNT (Observatoire des Micro et Nanotechnologies) for Optics.

Jean-Louis Malinge is an accomplished Business Management executive with extensive experience as a General Manager and CEO in France and the United States. He also serves in numerous Boards of Directors. He is adept in formulating strategies to position or reposition businesses, has led numerous acquisition projects and managed the creation of a successful joint venture in Asia. Jean-Louis is currently a Venture Partner with Arch Venture Partners. He is also Managing Director of YADAIS, a consulting firm in Telecommunications and Photonics. Jean-Louis was Kotura's President and CEO from 2004 to 2013, when Kotura was acquired by Mellanox. Kotura, Inc., a worldwide leader in silicon photonics, designed, manufactured and marketed CMOS optical components that have been deployed throughout the communications network. Formerly, Jean-Louis served as Vice President – Optical Networking Products for Corning, Inc. Jean-Louis' prior experience include Technology Director with Amphenol and Thompson CSF in France. Jean-Louis' credentials include an Executive M.B.A. from MIT Sloan School in Boston, Massachusetts. He also holds an engineering degree from the Institut National des Sciences Appliquées in Rennes, France.

- Companies cited in the report:

A*Star, AIM Photonics, Altis, Amazon, Amicra, Amkor, ams technologies, Arista, Aryballe, Aurrion, Ayar Labs, Biacore, Broadcom, BSAC, Cadence, Caliopa, Ciena, Cypress, Dell, eLichens, EVG, facebook, ficontec, Finisar, Georgia Tech, GlobalFoundries, Google, hp, Huawei, IBM, IMEC, imt, Infinera, Intel, Juniper Networks, Kaiam, Lenovo, Leti, Luxtera, MACOM, Mentor Graphics, Micralyne, Microsoft, MIT, Molex, Novati, NTT, NXP, Oclaro, Opticap, Physical Sciences, Ranovus, Rockley Photonics, Seagate, Sicoya, Silex, Skorpis, Soitec, STM, Sun Microsystems, Synos, Teramount, Towerjazz, Tyco, TU Delft, Tyndall University, University of Colorado, Velodyne, VLC Photonics, Yahoo, and many more.

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About Yole Développement – www.yole.fr

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole Développement group has expanded to include more than 50 collaborators worldwide covering MEMS, Compound Semiconductors, LED, Image Sensors, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The “More than Moore” company Yole, along with its partners System Plus Consulting, Blumorpho and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

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