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Roadmap of optical circuit boards and their related packaging technologies

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TECHNICAL REPORT

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ROADMAP OF OPTICAL CIRCUIT BOARDS AND THEIR RELATED PACKAGING TECHNOLOGIES

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86/442/DTR	86/453/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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ROADMAP OF OPTICAL CIRCUIT BOARDS AND THEIR RELATED PACKAGING TECHNOLOGIES

1 Scope

This Technical Report covers the roadmap of optical circuit boards, and its related packaging technologies including optical circuit board connectors and optical modules on boards.

2 General

2.1 Background of optical packaging technology road map

The volume of network traffic is dramatically increasing due to the amount of data being captured, processed, conveyed and stored as digital information. This information is generated from many sources, including critical business applications, email communications, the Internet and multimedia applications which have collectively fuelled an increase in demand for data networking and storage capacity. In addition, the proliferation of media rich applications, such as digital music and video sharing services is fuelling a concurrent increase in data processing in data centres [1][1]. The growth in network traffic attributed to personalized content is 20 % per month, giving rise to a doubling of network traffic every 1,5 years. However, this is out of step with the input/output (I/O) performance or I/O throughput of servers, which doubles every 2 years. Therefore, there is an increasing gap between the performance evolution of network equipment such as servers, and the growth in network traffic (Figure 1) [2].

[1] Figures in square brackets refer to the Bibliography.

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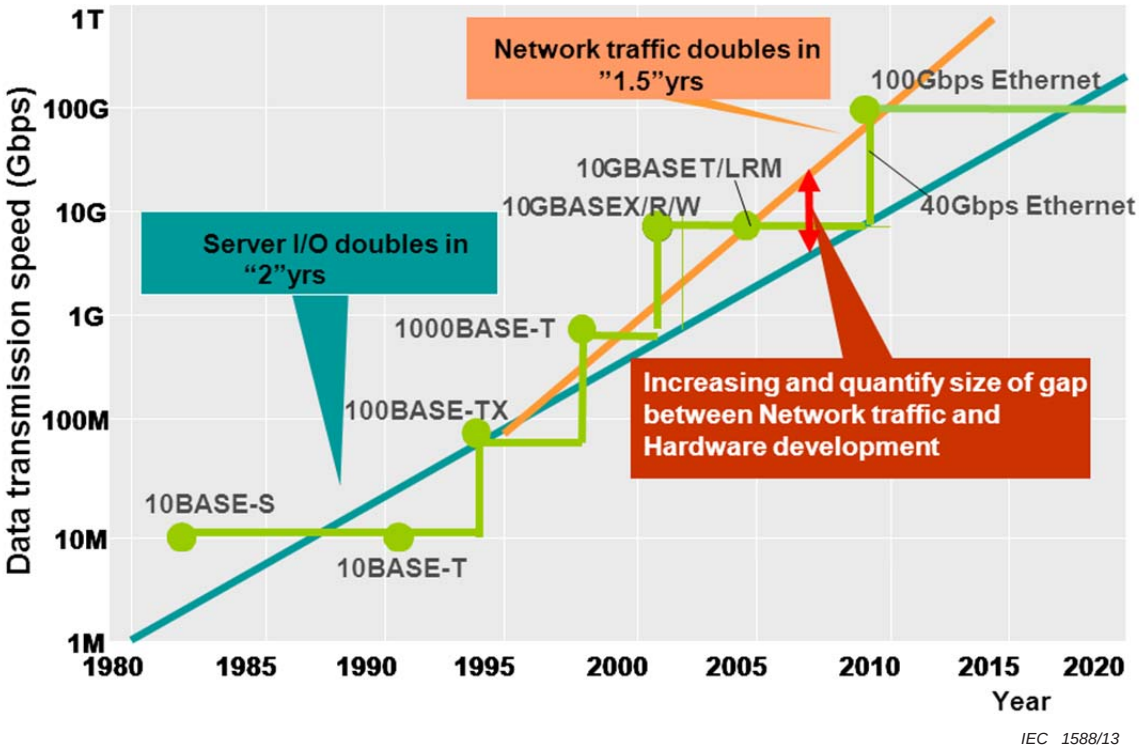

Figure 1 – Data transmission speed and capability trends for network traffic and server systems [2]

In general, system power consumption will increase as the volume of internet traffic expands. By 2020, power consumption in network routers in Japan will reach the gross power generation of Japan in 2005. An energy saving by 3 to 4 orders of magnitude in network router technology is required in 2030 to meet the stipulated targets in the Kyoto protocol [3] (Figure 2).

In addition, the bandwidth and density requirements for interconnects within high-performance computing systems are becoming unmanageable, due to increasing chip speeds, wider buses and larger numbers of processors per system [4]. The increase in system bandwidth and density required to satisfy this demand would impose unmanageable cost and performance burdens on future data networking and storage technologies.

An alternative to the current electrical printed circuit board (PCB) interconnect technology is required across multiple high-speed application spaces to mitigate this common trend. Optical interconnects are expected to bridge the performance gap between network hardware and traffic, and give rise to a reduction in hardware power consumption while increasing bandwidth density by over two orders of magnitude.

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