Recent Standardization Activities in the Optical Internetworking Forum (OIF)

Hirokazu Kubota†

Abstract

Interoperability is indispensable for worldwide development of networking solutions and services. The Optical Internetworking Forum (OIF) promotes interoperable solutions through the creation of Implementation Agreements (IAs) for optical networking technologies. This article provides an overview of the physical link layer part of OIF standardization activities.

1. About OIF

The Optical Internetworking Forum (OIF) is a non-profit organization launched in April 1998. It is an industry group uniting representatives from organizations involved in data and optical networks. Its members include many of the world's leading carriers, component manufacturers, and system vendors. The purpose of the OIF is to accelerate the deployment of interoperable, cost-effective optical networks. The OIF also provides feedback to worldwide standards organizations to help achieve a set of implementable, interoperable solutions. In June 2006, the OIF and the Network Processing Forum (NPF) merged to provide a broader scope of activities for the OIF's mission. Standardization in the OIF is mainly done through the creation of Implementation Agreements (IAs). The OIF creates IAs for external network element interfaces, software interfaces internal to network elements, and hardware component interfaces internal to network elements. It has created more than 30 IAs, 10 white papers, and many press releases. All of them are open to public and can be downloaded from the OIF website [1], which also has hyperlinks to published articles.

2. Organization of the OIF

The OIF consists of two types of committees: the Market Awareness & Education (MA&E) Committee and the Technical Committee (TC). The MA&E Committee is responsible for the overall operations of the OIF's marketing and education activities. The TC's mission is to accomplish the technical objectives of the OIF. The TC consists of some working groups (WGs) focusing on specific areas, where there is a need for IAs. The TC has three types of WGs: those under Networking, Physical Link Layer (PLL), and Software and Benchmarking, as shown in **Fig. 1**. The OIF TC and MA&E meeting is held once every quarter year. The committees of the networking and PLL groups are held in parallel. This article overviews recent topics of the PLL part of OIF standardization activities.

3. Recent activities

3.1 Tunable lasers

The OIF has created three IAs concerning tunable lasers. Looking ahead, the industry will need a tunable laser that can to be incorporated into small form factor (SFF) transponders. The integrable tunable transmitter assembly (ITTA)-SFF project builds on the existing module agreement and addresses the issues related to laser integration into a $3'' \times 2.2''$ 300-pin MSA (multisource agreement) transponder. Substantial work has been invested in the project. The conclusions are documented in the ITTA-SFF white

† NTT Network Innovation Laboratories
Yokosuka-shi, 239-0847 Japan
E-mail: kubota.hirokazu@lab.ntt.co.jp

† This report solely represents the author's view and interpretation of the activities of OIF meetings, which in some cases may differ from the official position of the OIF.

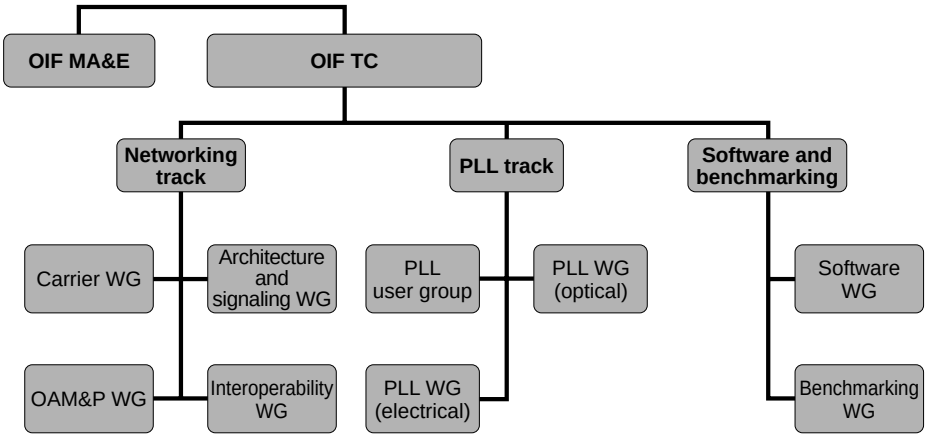


Fig. 1. Organization of the OIF.

paper. It should help to promote standardization in the marketplace and drive the adoption of tunable lasers and tunable transponders.

3.2 Common electrical interface

The purpose of the common electrical interface (CEI) is to provide higher-density and/or lower-cost interfaces for payloads of 10 Gbit/s and higher. The CEI-IA define data characteristics such as transition density and maximum run length, channel models, and compliance parameters supporting the physical reach and conditions. The CEI-IA is intended to be referred from other IAs such as system interface level 5 (SxI-5), serdes (serializer/deserializer) framer interface (SFI)-4.2, SFI-5, system packet interface (SPI)-5.1, and TDM fabric-to-framer interface (TFI)-5.

3.2.1 StatEye 4

The CEI channel compliance methodology defines a mathematical model for determining channel compliance. StatEye is a software implementation of this mathematical model. It is an open source script running on MATLAB initially developed by the OIF membership [2]. StatEye 4 is a modification of the open source version (ver. 2.1) in order to meet the current needs of the OIF. It runs on Windows and Linux. StatEye 4 has a graphical user interface, which allows easy setup of an analysis project.

3.2.2 CEI-25G

CEI-25G is a 100–160-Gbit/s interface for future platforms. The narrow interface provides smaller package sizes and lower power dissipation. A CEI-25G project is to define a CEI that support bit rates from 20 to 25+ Gbit/s per lane over glass fiber epoxy laminate (FR4) printed circuit boards. The channel model is analyzed for some available FR4 resins including high-performance resin to determine achievable reaches and explore challenges and possibilities for improvement.

3.3 SFI-5.2

SFI is an interface between optical modules (serdes) and framers within the physical layers. SFI-5.2 (SFI-5 Phase 2) is an interface, based on 4 data lines plus a deskew channel, for various applications at a data rate of 40 Gbit/s. Each data path supports data rates from 9.952 to 11.1 Gbit/s and the interface is point-to-point for FR4 printed circuit boards up to 8″ data path. When the proposed implementation does not meet the requirements of CEI, discussions are held to determine how to modify the CEI or contrive ways to meet it. For even higher bit-rate purposes, SFI-x, an SFI interface designed to support 100–160-Gbit/s line rates has been proposed.

3.4 Extending the reach at 10 Gbit/s

The OIF is running two groups of projects for extended reach optical transmissions. One utilizes an electronic dispersion compensator (EDC) and the other utilizes a multi-level modulation. For the EDC project, the OIF has been liaising with ITU to support the creation of new application codes for a 120-km reach utilizing an EDC-based receiver. The EDC project has now moved on to define interoperability. For the multi-level modulation, the OIF has proposed a new application code for multi-level modulation (duo-binary modulation) for 10-Gbit/s 120-km links to ITU and demonstrated it at OFC/NFOEC 2006.

3.5 SLA

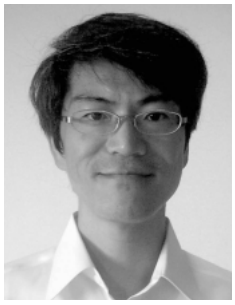
The look-aside interface is an interface between network processing elements and a look-aside device such as memory or a co-processor. The number of pins is growing fast so the routing of parallel interfaces is becoming very complex; therefore, traditional look-aside applications are evolving to become serial. The serial look-aside interface (SLA) enables next-generation high-density 10–160-Gbit/s system designs. The SLA will support n × 4 serial lanes at data rates of 10–80 Gbit/s.

4. Other business

The OIF is also making efforts for market awareness. In March 2006, the OIF demonstrated the interoperability of transponders and optical components for "very long reach (VR)" applications using alternative modulation techniques at the OFC 2006 in Anaheim, California. This demonstration was based on application code for very long reach links, developed in conjunction with ITU-T SG 15. Recently, the OIF made a presentation at iPOP 2006 in Tokyo. It is also planned to have a booth at ECOC 2006 and GlobalCOMM 2007.

References

[1] http://www.oiforum.com/
[2] http://www.stateye.org/



Hirokazu Kubota
Senior Research Engineer, Photonic Transport Network Laboratory, NTT Network Innovation Laboratories.
He received the B.S. and M.S. degrees in physics from Osaka University, Osaka, and the Ph.D. degree in engineering from the University of Tokyo, Tokyo, in 1984, 1986, and 1996, respectively. He joined NTT Ibaraki Electrical Communication Laboratories in 1986. He is a member of the Institute of Electronics, Information and Communication Engineers (IEICE) of Japan, the Optical Society of America, and IEEE. He received the IEICE Young Researchers' Award and the IEICE Best Paper Award in 1991 and 1994, respectively.