FASA®: New Access System Architecture

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Abstract

NTT Access Network Service Systems Laboratories has been promoting new access system architecture called FASA® (Flexible Access System Architecture), and researching and developing the modularization of functions making up the access system. This article introduces the technology behind the software modularization of the dynamic bandwidth allocation function, which was announced in a press release in November 2018 and demonstrated for the first time at NTT R&D Forum 2018 Autumn.

Keywords: FASA, access system, DBA

1. Introduction

NTT Access Network Service Systems Laboratories has been researching and developing FASA®*1 (Flexible Access System Architecture) as the optical access system of the future since it announced the concept in February 2016 [1, 2]. FASA reflects the research and development (R&D) of competitive network infrastructure technologies that enable the functions making up the access system to be extensively modularized and combined as needed. The aim here is to achieve an optical access system that can replace functions in a flexible and rapid manner according to service requirements.

The access system in widely used passive optical network (PON) systems has a point-to-multipoint network configuration on which users share a single optical fiber and bandwidth via fiber splitters. Here, the function that governs the performance of a PON system is dynamic bandwidth allocation (DBA), which, as the name implies, allocates bandwidth dynamically according to user bandwidth requirements.

At NTT Access Network Service Systems Laboratories, we considered that the optical access system could be applied to a wide array of services if the DBA function in a PON system could be replaced as needed. With this in mind, we conducted R&D and established software modularization technology for the DBA function, proposed two optical line terminal (OLT) models capable of incorporating the function, and enabled both OLT models to accommodate the softwarized DBA function (**Fig. 1**).

2. Software modularization technology for DBA function

The DBA function must be capable of high-speed processing on the sub-millisecond order to allocate bandwidth to each user according to fluctuating bandwidth requirements. To enable function replacement as needed while maintaining high-speed processing, we modularized the DBA function into a high-speed processing section and an algorithm whose specifications would differ for each service and implemented the former as hardware and the latter as software. We also defined the interface between the software and hardware components as an application programming interface (API)*2 and promoted its standardization at the Broadband Forum industry organization, which completed the process in 2018.

As a result, the DBA function can be replaced as

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*1 FASA is a registered trademark of Nippon Telegraph and Telephone Corporation in Japan.
*2 API: Interface specifications for exchanging information between two components.
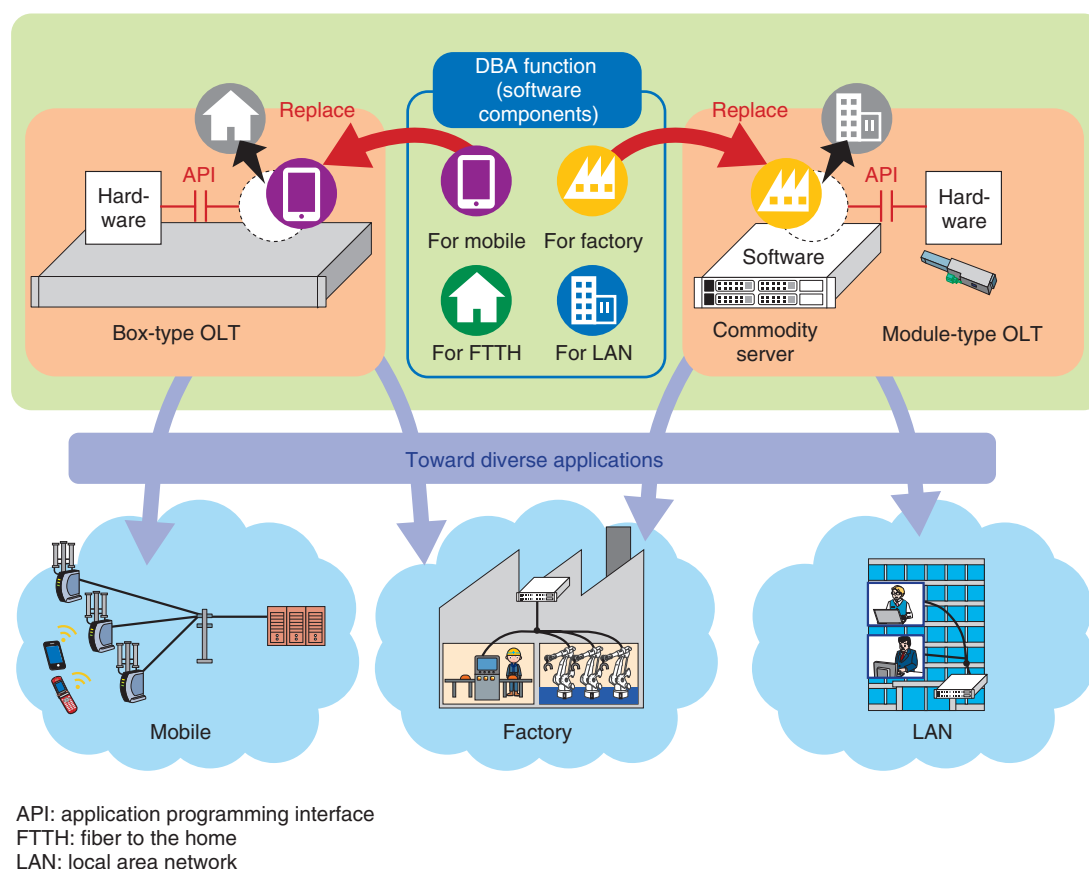
API: application programming interface
FTTH: fiber to the home
LAN: local area network

Fig. 1. Replacement of softwarized DBA function to meet service requirements.

needed according to service requirements while achieving high-speed processing.

3. Two OLT models and API implementation

We defined two OLT models to enable a PON system to be used in a variety of applications and developed a prototype OLT of each model for evaluation.

The first model is a box-type OLT for use in environments such as a telecommunication carrier's exchange office. We expect it to be applied to future mobile systems in addition to existing FTTH (fiber-to-the-home) services. The second model is a module-type OLT, which is implemented only for OLT functions that must be processed by hardware in a compact module in combination with a commodity server that stores the OLT functions modularized in software. We expect this type of OLT to be applied to factories and local area networks on university campuses, and in office buildings and other such settings.

In either of these OLT models, the incorporation of

an API enables the DBA function to be replaced with another one according to the application. This scheme eliminates the need for extensive equipment upgrading at the hardware level according to service requirements and enables the application range of optical access systems to be expanded.

4. Future plan

Going forward, the team at NTT Access Network Service Systems Laboratories plans to pursue software modularization for functions other than the DBA function in cooperation with carrier system vendors, standardization bodies, and open source software organizations throughout the world. The goal here is to enable the optical access system to be applied to a wide variety of services.

References

[1] Press release issued by NTT, "Introducing the New FASA Concept for

Future Access Systems," Feb. 8, 2016.
http://www.ntt.co.jp/news2016/1602e/160208a.html

[2]   FASA home page, http://www.ansl.ntt.co.jp/e/global/FASA/index. html

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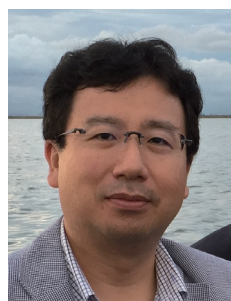
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