ATM Forum Activities and NTT's Contributions

Tatsuro Murakami†

Abstract

The ATM Forum was established in 1991 to specify de facto standards for the global communications market and to promote market awareness and knowledge about technical and commercial developments utilizing ATM. The forum has three world-wide offices under its board of directors and it has greatly influenced the ATM market. NTT joined the forum in early 1993 and made many contributions to its efforts. This article summarizes the forum's accomplishments and NTT's contributions.

1. Introduction

The ATM forum [1] was founded in 1991 to make uniform global de facto standards for ATM and to disseminate them among the world's major carriers, expecting ATM technology to be used to provide B-ISDN and major vendors supplying switches to them. While the forum studied and specified the basic standards, the number of members increased to over 900 organizations five years after it was founded. From 1991 to 1996, the market continued to grow rapidly and ATM developed its most important basic role: to turn carriers services into B-ISDN-based services. At the same time vendors who manufactured ATM nodes (*e.g.,* switches, transmitters, and user interface terminal equipment), competed to gain shares in this market while conforming to the proceedings of the forum's specifications. Due to strong competition in the market, a wide variety of ATM products had been released in the data communication market by 1997.

Carriers started to implement ATM services on the commercial level in 1996 using the ATM nodes available. The forum's standards contributed overwhelmingly to the extensive growth of this market and managed to hold a steady position among ATM commercial technologies with the ITU-T ATM standards at that time. In 1996, the forum agreed that its de facto

standards were unique to the world (Anchorage Accord). This accord accelerated the development and commercialization of ATM products. This article summarizes the forum's activities and NTT's contributions.

2. Basic technologies of ATM

ATM is a kind of packet transfer method. It uses a cell with a fixed length (53 bytes) and relays cell flows node-by-node as long as there are time slots available for transfer.

STM (Synchronous Transfer Mode), which is used for PSTN (Public Switched Telephone Network) services, is based on time division multiplexing (TDM). It allocates one time slot in a synchronous frame to one user, so there may be empty time slots that are not allocated to any users. In addition, using a cell with a fixed length enables various kinds of multimedia transfers with different bandwidth to be mixed on a line, that is, many users' cells can be transferred as long as empty slots are available in the frames of a TDM line. In other words, we have virtual paths (VPs) and virtual circuits or channels (VCs) on a line. ATM controls and manages them with the many mechanisms of the ATM nodes and associated operational support system.

As ATM was developed for B-ISDN services, its standards have a very wide range and strict conformances to provide a variety of carrier services with reliability and high quality as well as conforming to

† NTT Service Integration Laboratories
Musashino-shi, 180-8585 Japan
E-mail: murakami.tatsuro@lab.ntt.co.jp

ITU-T standards (Fig. 1). Tracing the process of the forum studies, the first efforts were directed at making the basic specifications, which are very important, like UNI (User Network Interface), NNI (Network to Network Interface), traffic management, and network management. Also specified were control signaling with address and routing, the ATM adaptation layer (AAL) between upper service layers and the ATM layer, and the physical layer under the ATM layer. These standards enable node products from different vendors to be connected to one another correctly, which has resulted in market expansion. After the Anchorage Accord in 1996, the forum continued to work on extensions of the basic specifications for various applications in combination with other transfer technologies such as the frame relay, IP-LAN (Internet Protocol Local Area Network), TDM line emulation, existing voice transfer, and IP/MPLS (IP Multi Protocol Label Switching). All these led up to the forum's current studies into IP network collaboration.

3. NTT's contribution and outputs

NTT has contributed overwhelmingly to the forum's activities since joining in 1993. Many of the standards that have been implemented are NTT-related. The three main ones are described here. First, for traffic management, NTT joined the studies and coordinated the standards with our node products. The ATM node (AHM) was first developed successfully at NTT and we proceeded to develop a series of ATM nodes with the same standards scheme. Second, for residential broadband, we proposed an effective user access method using ATM-PDS (Passive Double Star) and contributed positively to its study, based on forum activity, resulting in NTT establishing the standardization consortium called FSAN that brings together major carriers from around the world in cumulative standardization policies. As a result of this, the method that NTT proposed became an ITU-T Recommendation. Third, for voice telephony over ATM (VTOA), NTT suggested the carrier common requirement for transferring voice calls packetized into ATM cells using dedicated lines for compatibility with public network interfaces. Moreover, we accelerated the study of voice compression, which was being independently pursued for dedicated lines and mobile services, to ensure that they comply with

AAL: ATM Adaptation Layer
BICI: B-ISDN Inter-Carrier Interface
LANE: LAN Emulation
MPOA: Multi Protocol over ATM
VBR-nRT: Variable Bit Rate–non Real-Time
UBR: Undefined Bit rate
CBR: Constant Bit Rate
IISP: Interim Inter-Switch Signaling Protocol

p-mp: Point-Multipoint
SVC: Switched Virtual Circuit (Channel)
PVC: Permanent Virtual Circuit (Channel)
TM: Traffic Management
LES: Loop Emulation Service
FBATM: Frame-based ATM
FATE: FBATM Transport over Ethernet
FAST: FBATM over SONET/SDH Transport
VoDSL: Voice over Digital Subscriber Line

PNNI: Private Network-Network Interface
AINI: ATM Inter-Network Interface
MDCR: Minimum Desired Cell Rate
ABR: Available Bit Rate
GFR: Guaranteed Frame Rate
VTOA: Voice &Telephony Over ATM
VPN: Virtual Private Network
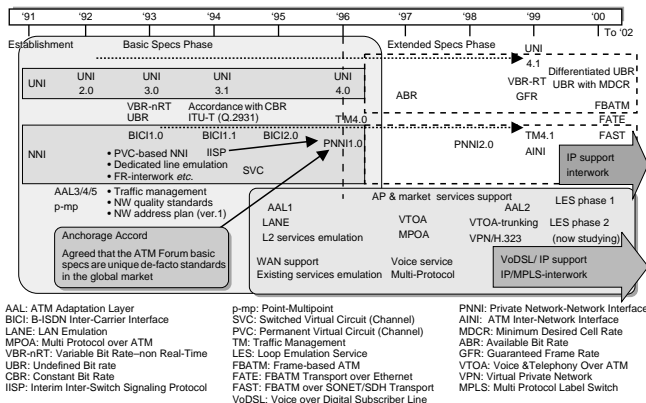MPLS: Multi Protocol Label Switch

Fig. 1. Main activities and outputs of the ATM Forum.

each other. This suggestion became a short-term ITU-T recommendation. In addition, on wireless issues, NTT joined the study of 'mobile ATM' standards, including the implementation of connection-holding functions like hand-over.

4. Current status

The ATM forum is now proceeding with extensions and interworking issues with IP/MPLS based on the basic forum standards. In the telecommunication market, ATM services and products continue to be provided but growth has flattened. The major factor in the market recently has been the emergence of IP services. Considering all these circumstances, NTT decided not to renew its membership in the ATM forum last December because we have completed our initial goals: that is, we have contributed to ATM standardization, fed results back to our R&D products, promoted market awareness, and supported the provision of various ATM services by NTT group companies. We expect the current ATM services that our companies are providing to continue smoothly and become more profitable in the future as a result of being built around the ATM forum standards in which we were involved.

Reference

[1] http://www.atmforum.com/

Tatsuro Murakami
Director, NTT Network Service Systems Laboratories.
He received his BS and MS degrees in Physics from the Tokyo Institute of Technology in 1979 and 1981, respectively. He is part of NTT's main R&D efforts and is responsible for leading developments in services and network architectures. His primary objectives as director include establishing network architectures and service concepts, promoting technology standards, and planning the overall development of network elements and their introduction into the NTT's service network.