Zeitschrift: Technische Mitteilungen / Schweizerische Post-, Telefon- und Telegrafenbetriebe = Bulletin technique / Entreprise des postes, téléphones et télégraphes suisses = Bollettino tecnico / Azienda delle poste, dei telefoni e dei telegrafi svizzeri

Herausgeber: Schweizerische Post-, Telefon- und Telegrafenbetriebe

Band: 73 (1995)

Heft: 8

Artikel: ATM-Access unit : a flexible and scalable platform

Autor: Atkinson, Andrew

DOI: https://doi.org/10.5169/seals-875971

BROADBAND NETWORK EVOLUTION USING THE ATM ACCESS UNIT

ATM ACCESS UNIT – A FLEXIBLE AND SCALABLE PLATFORM

The ATM Access Unit (AAU) is positioned as a public network ATM Edge Switch. It combines ATM switching and service adaptation, allowing end customers direct access to high-speed ATM network infrastructure. The article describes the positioning of the AAU in current network deployments. This includes a discussion of the services being offered and the important features of the system to fulfil market requirement. Phased introdution must be the key to success for broadband services. This allows the network operator and vendors to gain experience and adapt to customer trends. A discussion of possible evolution strategies is included to indicate how the long-term objective of a Broadband Integrated Services Digital Network may be achieved.

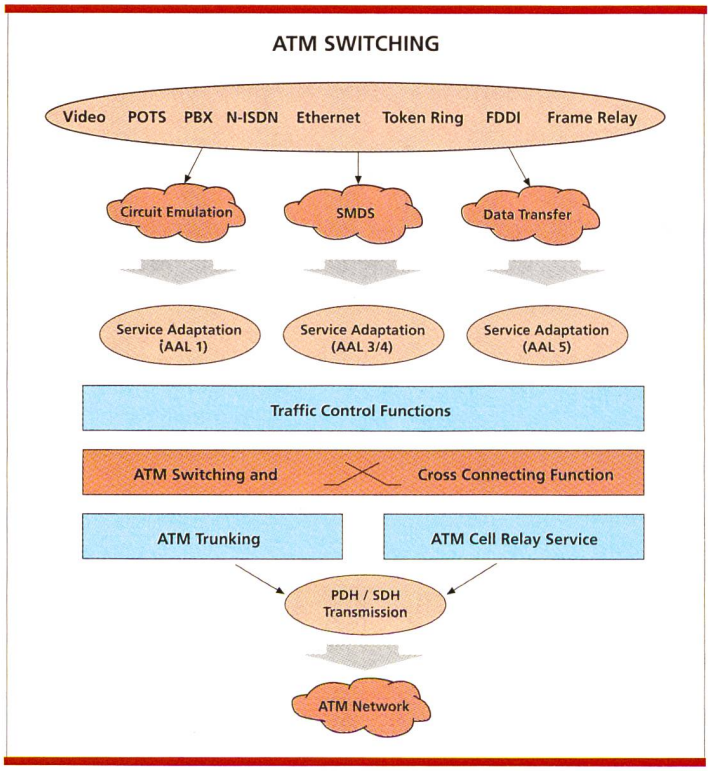

Fig. 1. Sevice adaptation and ATM switching – the cornerstone of the AAU

In 1876, 'The Telephone' magazine wrote: 'When at last this little instrument (the telephone) appeared, consisting, as it does, of parts which every one of which is familiar to us, and

ANDREW ATKINSON, BERN

capable of being put together by an amateur, the disappointment arising from its humble appearance was only partially relieved on finding that it was really able to talk.'

Even accounting for the digital revolution, the equipment may have changed, but the services offered remain largely the same. However this may now change, due to the current service revolution driven by home and business computing having widespread availability and the introduction of intelligent networks, which enhance and offer new network – based services. ATM ist the key technology facilitators for this change.

There has been a phased approach to ATM deployment. There have been a number of successful technology trials (e.g. the Eurescom ATM Pilot and RACE Testbeds), leading to first commercial ATM services being offered in 1995. ATM 'overlay' networks are now being introduced as high-speed network infrastructure for business data networking over the wide area. Interconnection of legacy LANs and host computers located in physically different sites is one of the main applications. This traffic was traditionally supported using leased lines; ATM offers a service in which bandwidth is paid for by usage providing cost savings.

This document defines how the ATM Access Unit (AAU) can be placed in the ATM overlay network to support such network applications. But it is also important to avoid short-termism and to plan for network evolution; therefore, the evolution of the AAU as a platform for the B-ISDN is also considered.

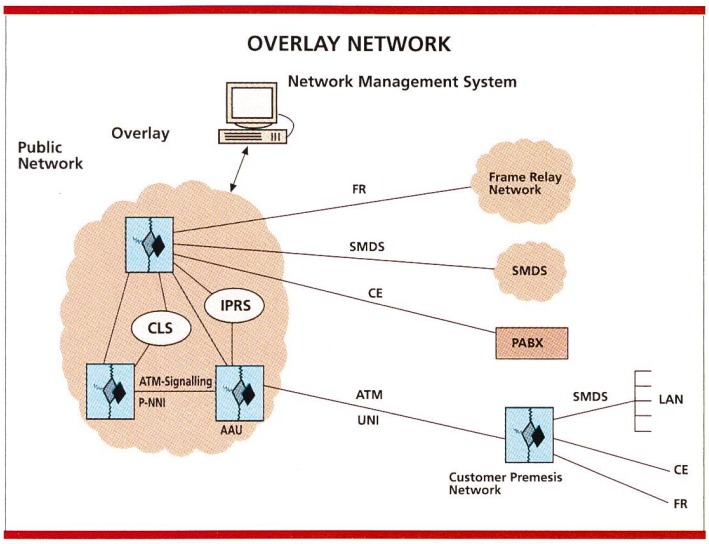

Fig. 2. ATM Overlay Network (combining transport, switching and management)

The AAU

The AAU family of products realizes a scalable ATM switching platform to suit the needs of first-phase ATM deployment for public networks serving corporate customers and the long-term goal of the fully integrated broadband network for residential and business customers. Interworking with existing networks is the key to ATM deployment, and this is reflected in the service adaptation features supported in the AAU for SMDS, Frame Relay, N-ISDN, and LAN-type protocols.

Quality of Service (QoS) classes are supported within the switch. Each QoS class is defined in terms of parametres such as Cell Delay, Cell Delay Variation, Cell Loss Ratio and Cell Misinsertion rate required by the ATM connection. This allows full support of CBR traffic (such as the Circuit Emulation Service), VBR Connection-oriented traffic, and VBR Connectionless traffic. Additionally, Unspecified Bit Rate traffic is supported to allow the link capacity to be fully utilized, therefore optimizing the use of resources.

Management of AAUs

The AAU Management System contains:

- Service Management: A service management application to allow fast and easy service activation, monitoring, accounting, and performance management for the ATM Cell Relay Service.
- Customer Network Management: Configuration Management of VPN resources and reporting of Performance, Accounting, and Fault Management data to the Customer Network Management.
- End-to-End Network Management for the ATM Cell Relay Service.
- Data Communications Network based on ATM in-band, X.25 or N-ISDN.
- Element Management, allowing creation and administration of ATM Permanent Virtual Connections and AAU status management.

Broadband overlay network

Network operators are deploying broadband networks in response to an increased demand for bandwidth to interconnect corporate private networks over the wide area and to rationalize/upgrade existing network infrastructure using high-speed ATM technology infrastructure. As is shown in *Figure 2,* the overlay network provides a high-speed backbone for the interconnection of existing network islands and also high-speed wide area networking for customer networks. The logical network connectivity below is supported using an infrastructure of Sonet/SDH or PDH transmission equipment. The data communications network consists of a dedicated network used to manage AAUs in the public network and those in the customer premises network (where required).

The network topology for the business overlay network is essentially non-hierarchical, with customers access being offered on each network element. ATM Access Units may be deployed both in the overlay network and in the customer premises network. Connections may be set up either using the network management system (i. e. ATM leased lines) or using switched connections. Switched services are offered using a combination of the ATM Forum P-NNI protocol for networking nodes and the UNI protocol (ATM Forum or ITU-T) for the user access signalling.

The SMDS Connectionless Server (CLS), and the IP Routing Server (IPRS) perform address resolution required for connectionless data and LAN Emulation.

Application examples

LAN interconnect

Corporate customers have traditionally used leased lines, Frame Relay and SMDS to network their LANs and PBXs over the wide area. Using the overlay network infrastructure, different business locations may now be connected with high speed ATM switching, providing end users with a seamless distributed network for their applications and communications.

For LAN interconnection over the wide area there are a number of options depending on the existing network infrastructure. The customer has the option to:

- connect routers/bridges directly to the AAU, using SMDS or Frame Relay interfaces
- upgrade existing routers by feeder nodes which provide LAN to ATM interworking. Feeder nodes then connect to the AAU using ATM *(Figure 3).*

Mainframes may also be networked over the wide area, allowing a distributed processing platform to support end user applications.

PBX interconnection is provided using the Circuit Emulation Service. The AAU allows interworking between G.703/G.704 signals and N-ISDN to ATM.

Network rationalization

Network rationalization using ATM could provide considerable cost sav-

ings for operators. For example, many operators have deployed SMDS in metropolitan areas. These islands have often been interconnected using leased lines which are under-utilized due to the bursty nature of the data traffic. The ATM backbone infrastructure provides the operator with a costeffective solution for networking the SMDS service over the wide area, since ATM is a pay-by-usage service which allows statistical multiplexing of traffic. Therefore, the bandwidth is used to its optimum potential, and more customers traffic may be carried over the same network resources.

Network rationalization using the ATM backbone in a similar way can also apply to Frame Relay networks. For example, interconnection of Frame Relay switches over the wide area may be performed using the AAU as the service adaptation for Frame Relay to ATM mapping and then the ATM switching capability to transmit the data transparently, using the ATM Cell Relay Service to the far-end Frame Relay network.

A similar service adaptation and networking application might be envisaged for N-ISDN switch interconnection over the wide area; however, network operators have yet to consider this commercially.

One of the main features of ATM is also to allow integrated access of services. This allows the operator to deploy a single piece of equipment, where previously a number were required. This not only leads to clear economies of scale for equipment costs, but also reduces the maintenance required.

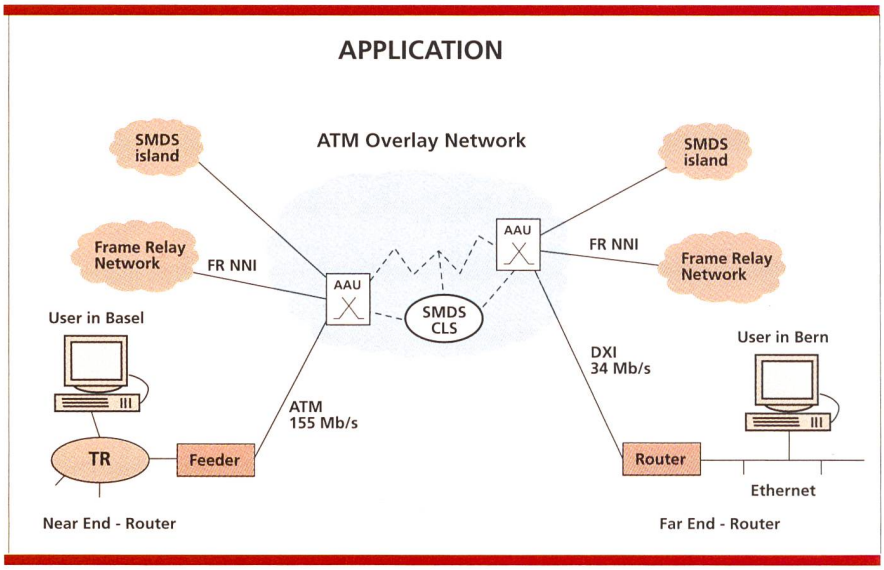

Fig. 3. Application examples

Network evolution

The evolution from the business overlay networks to full B-ISDN is far from clear; however, based on feedback from operators, some general trends can be seen. Starting from the wide area broadband business market, where the Public Service Providers (PSPs) are offering trunking services (commodity bit carriers), a possible evolution is as follows:

Initially, there is a clear distinction made between the core network infrastructure of a PSP and the overlay networks used to provide value-added services to a small proportion of corporate customers. The core infrastructure is owned by the PSPs only, and the overlay networks may be owned by a PSP or corporate service provider.

There will be strong penetration of the PSPs into the value-added services and internetworking markets. Economies of scale and strong focus on providing value-added services will give distinct cost advantages compared to the corporate service provider.

There will be evolution in terms of the system requirements imposed on vendors by operators. Virtual Private Network capability, security, service availability, network management, and network partitioning for control will be key issues and differentiators. This will split the market into two segments defined for the PSPs and the corporate service providers.

The initial overlay network will be merged with the core infrastructure network, as the demand for bandwidth increases, the customer base definition expands, and, most importantly, the broadband services become more widely accepted. An important feature of this consolidation will be interworking with existing narrowband networks and the development of powerful integrated management for switching, transmission, and access equipment. Large capacity and geographical network coverage will signal the true availability of broadband services for business and for residential customers alike.

CONCLUSION

The AAU is a flexible and scalable platform which can be used for first-phase ATM deployment to support corporate customer networking over the wide area. We identify the following functionality as being critical:

- **Quality of Service classes allowing service flexibility according to end customer requirements.**
- **High service availability and reliability. This is provided by exploiting Ascom's technical strengths, experience, and reputation for being a telecommunications equipment vendor.**
- **Facilities for end-to-end service provisioning and management.**
- **Remote management of equipment.**
- **A clear migration path, using the AAU as a platform for future broadband service development.**

Acknowledgement
It is a pleasure to acknowledge the contribution made by colleagues in Business Unit Broadband Access.

Andrew D. Atkinson, 1968, graduated from the University of East Anglia, UK with BSc (Hons) degree in Mathematics. He subsequently joined the Network Performance and Design Division at British Telecom Laboratories, Ipswich, UK in 1991. He was primarily involved in performance modelling for broadband networks, specializing in control issues and service adaptation for Asynchronous Transfer Mode. He joined Ascom Hasler AG in January, 1995, where he is currently part of the product management team for the ATM Access Unit within the Public Switching Division.