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PROSPECTS FOR THE USAGE OF ATM TECHNOLOGY IN MODERN COMMUNICATION NETWORKS

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Перспективы использования технологии ATM в современных сетях связи

В данной статье приводится краткий обзор технологии ATM. Статья охватывает основные принципы ATM, сопутствующую терминологию и вводит ключевые понятия, применяемые параметры трафика и QoS характеристики с точки зрения использования в современных сетях.

What is ATM? Asynchronous Transfer Mode (ATM) is a technology designed for the high-speed transfer of voice, video, and data through public and private networks using cell relay technology. ATM is an International Telecommunication Union Telecommunication Standardization Sector (ITU-T) standard. Ongoing work on ATM standards is being done primarily by the ATM Forum, which was jointly founded by Cisco Systems, NET/ADAPTIVE, Northern Telecom, and Sprint in 1991. A cell switching and multiplexing technology, ATM combines the benefits of circuit switching (constant transmission delay, guaranteed capacity) with those of packet switching (flexibility, efficiency for intermittent traffic). To achieve these benefits, ATM uses the following features:

- Fixed-size cells, permitting more efficient switching in hardware than is possible with variable-length packets;
- Connection-oriented service, permitting routing of cells through the ATM network over virtual connections, sometimes called virtual circuits, using simple connection identifiers;
- Asynchronous multiplexing, permitting efficient use of bandwidth and interleaving of data of varying priority and size;

The combination of these features allows ATM to provide different categories of service for different data requirements and establish a service contract at the time a connection is set up. This means that a virtual connection of a given service category can be guaranteed a certain bandwidth, as well as other traffic parameters, for the life of the connection.

Traffic Contracts and Service Categories. ATM connections are further characterized by a traffic contract, which specifies a service category along with traffic and quality of service (QoS) parameters. Five service categories are currently defined, each with a purpose and its own interpretation of applicable parameters. The following sections describe the components of the traffic contract, the characteristics of the service categories, and the service-dependent AAL that supports each of the service categories.

The Traffic Contract. At the time a connection is set up, a traffic contract is entered, guaranteeing that the requested service requirements will be met. These requirements are traffic parameters and QoS parameters:

Traffic parameters—generally pertain to bandwidth requirements and include the following:

– Peak cell rate (PCR);

– Sustainable cell rate (SCR);

– Burst tolerance, conveyed through the maximum burst size (MBS);

– Cell delay variation tolerance (CDVT);

– Minimum cell rate (MCR).

QoS parameters—generally pertain to cell delay and loss requirements and include the following:

– Maximum cell transfer delay (MCTD);

– Cell loss ratio (CLR);

– Peak-to-peak cell delay variation (ppCDV).

The Service Categories. One of the main benefits of ATM is to provide distinct classes of service for the varying bandwidth, loss, and latency requirements of different applications. Some applications require constant bandwidth, while others can adapt to the available bandwidth, perhaps with some loss of quality. Still others can make use of whatever bandwidth is available and use dramatically different amounts from one instant to the next. ATM provides five standard service categories that meet these requirements by defining individual performance characteristics, ranging from best effort (Unspecified Bit Rate [UBR]) to highly controlled, full-time bandwidth (Constant Bit Rate [CBR]). Table 1. lists each service category defined by the ATM Forum along with its applicable traffic parameters and QoS characteristics.

Table 1. Service Categories and Characteristics

Service Category	Traffic Parameters	QoS Characteristics	
		Cell Loss	Cell Delay
CBR—constant bit rate	PCR	low	low
VBR-RT—variable bit rate real-time	PCR, SCR, MBS	low	low
VBR-NRT—variable bit rate non-real time	PCR, SCR, MBS	low	unspecified
ABR—available bit rate	PCR, MCR	unspecified	unspecified
UBR—unspecified bit rate	(no guarantees)	unspecified	unspecified

The characteristics and uses of each service category are summarized as follows:

• CBR service provides constant bandwidth with a fixed timing relationship, which requires clocking synchronization. Because CBR traffic reserves a fixed amount of bandwidth, some trunk bandwidth might go unused. CBR is typically used for circuit emulation services to carry real-time voice and video.

• VBR-RT service provides only a partial bandwidth guarantee. Like CBR, however, some bandwidth might still go unused. Typical applications include packetized voice and video, and interactive multimedia.

• VBR-NRT service provides a partial bandwidth guarantee, but with a higher cell delay than VBR-RT. This service category is suitable for bursty applications, such as file transfers.

• ABR provides a best effort service, in which feedback flow control within the

network is used to increase bandwidth when no congestion is present, maximizing the use of the network.

• UBR service provides no bandwidth guarantee, but attempts to fill bandwidth gaps with bursty data. UBR is well suited for LAN protocols, such as LAN emulation. An additional category, UBR+, is a Cisco extension to UBR that provides for a nonzero MCR in the traffic contract.

Conclusion. The great interest in ATM technology due to its unique benefits:

• High Speed,
• Integrated transport different kinds of information (data, voice, video, etc.),
• Optimal use of available bandwidth,
• Support of private and public networks,
• Technical basis for LANs and WANs,
• Simulation of packet switching and circuit switching,
• Support of services to different types of traffic,
• Support for multiple classes of service quality,
• Support of traffic with priorities,

Guaranteed QoS:

ATM networks can provide connections with guaranteed QoS. This may facilitate the operation, especially in higher level protocols multimedia network multimedia applications and streaming bit (CBR-Constant Bit Rate), which requires stringent controls on noise and delay network.

Integrated services:

Guaranteed quality service on site, along with functions based on the cell, allowing the development of an independent, multi-service network in which all types of traffic – data, audio and video – can be transmitted even reducing more cost and complexity of current networks multiple levels. Due to this ATM has a huge potential in the future development of the modern networks.

References

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