# Module 11

# Narrowband and Broadband ISDN

# Lesson

# 38

# B-ISDN

Version 1 ECE , IIT Kharagpur

## 11.3.1 INTRODUCTION

The need for a Broadband ISDN service sprung from the growing needs of the customers. The planned Broadband ISDN services can broadly be categorized as follows:

**Interactive services:** These are services allowing information flow between two end users of the network, or between the user and the service provider. Such services can be subdivided:

**Conversational services:** These are basically end-to-end, real-time communications, between users or between a user and a service provider, e.g. telephone-like services. Indeed, B-ISDN will support N-ISDN type services. (Note also that the user-to-user signaling, user-to-network signaling, and inter-echange signaling are also provided but outside our scope.) Also the additional bandwidth offered will allow such services as video telephony, video conferencing and high volume, high speed data transfer.

**Messaging services:** This differs from conversational services in that it is mainly a store-and-forward type of service. Applications could include voice and video mail, as well as multi-media mail and traditional electronic mail.

**Retrieval services:** This service provides access to (public) information stores, and information is sent to the user on demand only. This includes things like tele-shopping, videotex services, still and moving pictures, tele-software and entertainment.

**Distribution services:** These are mainly broadcast services, are intended for mainly one way interaction from a service provider to a user:

No user control of presentation. This would be for instance, a TV broadcast, where the user can choose simply either to view or not. It is expected that cable TV companies will become interested in Broadband

ISDN as a carrier for the high definition TV (HDTV) services that are foreseen for the future.

User controlled presentation. This would apply to broadcast information that the user can partially control, in that the user can decide which part of it he/she accesses, e.g. teletext and news retrieval services.

However, many of these services have very high throughput requirements, as shown in Table below. The burstiness is the ratio of the peak bit rate to average bit rate.

| **Service** | **Bit Rate [Mbps]** | **Burstiness** |
|---|---|---|
| Data | 1.5 to 30 | 1 – 50 |
| Document transfer | 1.5 to 45 | 1 – 20 |
| Videoconferencing or videotelephony | 1.5 to 130 | 1 – 5 |
| Broadband video | 1.5 to 130 | 1 – 20 |
| TV | 30 to 130 | 1 |
| HDTV | 130 | 1 |

It is clear that high network capacity is required if this kind of service is to be offered to many user simultaneously. The N-ISDN can currently offer interfaces which aggregate B-Channels to give additional throughput, as shown in Tables below. However, these are not sufficient for our Broadband service requirements.

| Channel | Bit rate [Kbps] | Interface |
|---|---|---|
| B | 64 | Basic rate |
| H0 | 384 | Primary rate |
| H11 | 1536 | Primary rate |
| H12 | 1920 | Primary rate |

| | | |
|---|---|---|
| D16 | 16 | Basic rate |
| D64 | 64 | Primary rate |

| Interface | Bit Rate [Kbps] | Structure |
|---|---|---|
| Basic rate access | 144 | 2B + D |
| Primary rate access | 1544 | 23B + 64D<br>3H0 + 64D<br>H11<br>Etc |
| Primary rate access | 2048 | 30B + 64D<br>5H0 + 64D<br>H12 + 64D<br>etc. |

### 11.3.2 B-ISDN NETWORK ARCHITECTUIRE

The B-ISDN needs to provide:

- Broadband services, as described in the last subsection.
- Narrowband services (for backwards compatibility).
- User-to-network signaling, to allow the B-ISDN user to initiate and control communication.
- Inter-exchange signaling within the network, to allow the network to provide and control resources as requested by the B-ISDN user or by another network exchange.
- User-to-user signaling, to allow B-ISDN users to send control, operation and maintenance information to each other.
- Management facilities for controlling and operating the network.

It is intended that the B-ISDN will offer both connection oriented (CO) and connectionless (CL) services, however, the CO mode of operation is receiving the greatest attention at the moment, while CL service definitions mature. The broadband information transfer is provided by the use of asynchronous transfer mode (ATM), in both cases, using

end-to-end logical connections. ATM makes use of small, fixed size (53 octets) cells in which the information is transferred, along the logical connections.

Each logical connection is accessed as a **virtual channel (VC)**. Many VCs may be used to a single destination and they may be associated by use of a **virtual path (VP)**. There relationship between VCs and VPs with respect to the **transmission path** is shown in Figure ❑. The transmission path is the logical connection between the two end-points, and consists in reality of many **links** between network exchanges and switches.

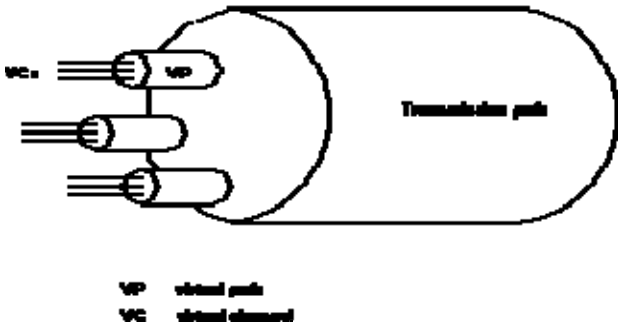

**Figure:** Transmission path model for Broadband ISDN

The VCs are identified at each end of the connection by a **virtual channel identifier (VCI)** and user-to-user data VCs are unidirectional. Similarly, the VP is identified by a **virtual path identifier (VPI)**. The VCI/VPI pair uniquely identifies a user-to-user information flow and is carried in each ATM cell header. Both VCIs and VPIs in general have only local significance. The concept of the **link** can be applied to both VCs and VPs in explaining the use of VCIs and VPIs, and we can say that the VCI/VPI pair identifies a particular link. VCIs and VPIs are used within the network for switching purposes, with **virtual channel links** and **virtual path links** being defined as the connection between two points where the either the VC or the VP is switched, respectively, i.e. the link is defined to exist between the two points where the VCI or VPI value is removed or translated (switched). There will be many virtual channel links comprising a **virtual channel connection (VCC)** and, similarly, many virtual path links in a **virtual path connection (VPC)**. This relationship is shown in Figure ❑ .

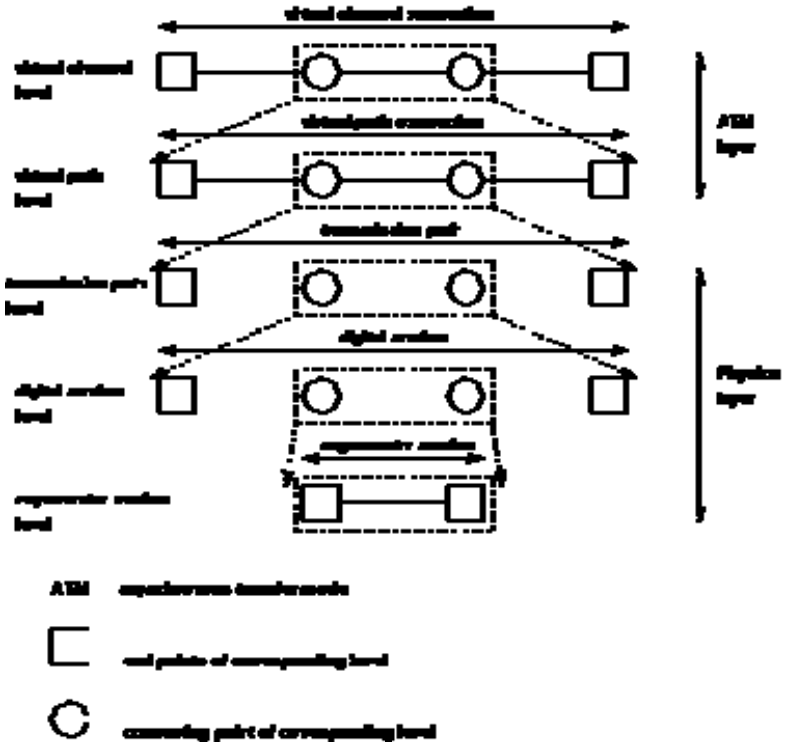

**Figure:** Hierarchical layer to layer relationship in the ATM layer and Physical layer

### 11.3.3 B-ISDN SIGNALING

Broadband ISDN uses out-of-band signaling (as does N-ISDN). Instead of using a D Channel as in N-ISDN, a special VCC can be used for signaling. This also means that the B-ISDN user can have a much more flexible and powerful signaling capability, as further VCCs for signaling can be established as required. As the B-ISDN is meant to backwards compatible with N-ISDN applications, the B-ISDN also provide N-ISDN signaling. Also, the B-ISDN services bring their own requirements for more powerful signaling:

- Establish, release and maintain VCCs as required.
- Negotiate and/or renegotiate the QoS for VCCs.
- Allow mutli-connection calls, i.e. composite calls that require several different types of information flow to the same destination. For instance, a multimedia call that carries voice, video and data may use one VC each for the voice, video and data, each with its own QoS requirements and synchronization requirements.
- Allow multi-party calls, i.e. calls between more than two end-points. For instance a conference call. This type of call requires facilities to allow users to leave or join the call/conference. If the call is a multi-media

conference, then the multi-connection signaling facility will also be required and should operate in harmony.

### 11.3.4 B-ISDN OPERATION AND MAINTENANCE

The operation and maintenance (OAM) of the B-ISDN network has five main actions:

**Performance monitoring** Managed entities are continuously or periodically monitored in order to generate maintenance event information.

**Defect and failure detection** Errors or malfunctions in the managed entities are detected or predicted resulting in the generation of maintenance event information or service alarms.

**System protection** To offer some degree of fault tolerance, the effect of failures in managed entities are minimised by the use of backups, standbys or other resources, and the failed entity is excluded form the normal operation of the system.

**Failure or performance information** Communication of failure and performance information as alarms to other managed entities in the management plane. Also acts as a response service to status report requests.

**Fault localisation** Use of test systems, both internal and external, to determine whether information about faults is complete or sufficient for other actions to take place.

These actions are supported by the use of OAM information flows in the ATM layer and Physical layer.

## Objective Questions

*38.01*

## Subjective Questions

*38.11*

## Level 2 Questions

*38.21*

Source: http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Communication%20network/pdf/11.3%20Lesson%2038.pdf