1. Introduction

ISDN (Integrated Services Digital Network) makes it possible to send, receive and modify information using telephone lines in ways that were not previously possible for speed, quality and other reasons. ISDN is not an application itself; it's really just a technique that works to augment applications. For instance, work at home for some engineers is too slow even over 9600 bps modems, but 64 kbps with a direct interface into their department LAN means that they can use the same software and have access to all the data as if they were in the office. Still and motion video pictures can now be sent between two or more parties without being in special conference rooms. Colleagues can jointly edit a report, graphics and a spreadsheet while talking on the telephone, despite being hundreds of miles away.

This document is a guidebook of solution sets that presents how ISDN is used to address common communications needs. It makes it easier for users, systems integrators and application developers to understand what ISDN components are needed to implement their applications and solutions. Thanks to an agreement by the major equipment makers called National ISDN, the building blocks for these solutions are now more standard than ever, which means more competition, better products and integral services by the telcos. National ISDN is the first step toward making consistent ISDN services available across the country.

The authors of this Catalog do not pretend that these solutions are a complete list. They know that some things you need aren't here. And they know that some things here will be used in ways they could not have imagined. That's all to the good.

The authors offer this catalog in the hope that you will use it as a guide, a reference, and a point of departure for the imagination.

Please note that a Reader Response Form is provided at the very end of this document should you desire to contribute your impressions on the merits of this Catalog.

1.1. Organization of the Second Edition

This is the Second Edition of "A Catalog of National ISDN Solutions to Selected NIUF Applications." It is again targeted to the community of systems integrators, application developers, and corporate telecom managers who want to learn how ISDN works - to solve their business communications problems and provide opportunities. However, the technical scope has grown to include both National ISDN-1 (NI-1) and NI-2, and the focus has sharpened on solutions.

Section 2, a new section for this edition, is for the decision maker who must decide whether or not to look at ISDN for solutions to meet his or her needs. It highlights the benefits of ISDN through simple examples of key applications. Tools are presented for analyzing the benefits and costs of an ISDN-based solution, and presents the status of ISDN-related interoperability.

Section 3 covers how ISDN can be used to meet a wide variety of business opportunities. The solutions show generically, but in detail, what end-systems are needed, and what network services are required. Each solution addresses a specific user need. Section 3 contains 40 solutions using Basic Rate Interfaces (BRI), with the features available under NI-1, and 4 BRI solutions that require the features available in NI-2. In addition, 17 solutions using Primary Rate Interface (PRI) features available in NI-2 are included. There are, in total, 26 new solutions in the Second Edition. In addition, all the solutions in this edition have been written in a new style for ease of use.

Section 4 is a product compendium resulting from a new survey of vendor information. Products covered in Section 4 include ISDN terminal equipment, software, and services. However, neither the NIUF or NIST recommends or endorses products or services and nothing contained herein is intended as a recommendation or endorsement of any product or service.

Section 5 covers selected topics on ISDN in greater technical detail. A variety of topics are covered, including: call types, SPIDs, and TEIs; rate adaptation; lower layer and higher-layer compatibility information elements; SS7; multiline hunt group; powering; configurations for high bandwidth applications; communication servers; parameter groups and interface groups; conformance testing; and signaling diagrams.

The catalog is a rich source of information on ISDN. A Bibliography is included, if you are new to ISDN and want an introductory text, check the Bibliography for titles. The Index is an excellent way to explore specific topics. The Annex presents background information on the activities of the North American ISDN User's Forum.

There are as many ways to use this book as there are readers. If you are using this book to learn ISDN, a good place to start is the Table of Contents. The rest of Section 1 contains an introduction to ISDN technology. Section 2 can help you get started on the decision making process. In Section 3, read those guides which look interesting to you. Look up the names of the various components necessary in the index, and find out where those products appear in Section 4. If you are already familiar with ISDN, take the time to flip through Sections 3 and 4 so that you know what is covered. Also look at Section 5, since there are several new topics discussed. Finally, the annex contains an overview of the activities of the NIUF. Also, please take time to complete the Reader Response form in the back of this document so that future editions of this document may be improved.

1.2 What is ISDN?

ISDN stands for "Integrated Services Digital Network." It is a set of integrated telecommunication services, available over the public telecommunications networks from many local and long distance telephone companies. It is also available over private networks. ISDN is a switched digital service. As such, its ability to support digital connections on an as-needed bandwidth basis makes it an essential building block of the nation's information infrastructure.

To take advantage of ISDN at a residence or small business, you must request ISDN service for one or more of your telephone lines from your local telephone company. Each offering is known as a "Basic Rate Interface" or BRI. It runs from your location to the telephone company's central office switch. If the person you are calling also has ISDN capability you will be able to take advantage of ISDN's higher data communications performance and features. If not, your terminal and the ISDN will have to interwork within the limitations of the premises equipment at the destination.

By using BRIs at each desktop connected to your internal telephone switch, or Private Branch Exchange (PBX), you can create an all digital network inside your organization using your present telephone wiring. If your installation requires many lines to the telephone company switch, your premises configuration may warrant a Primary Rate Interface.

For convenience in providing the appropriate voice and data services, ISDN divides its total information transmission capacity (bandwidth) into channels. Think of each channel as a virtual telephone line. If you have two channels, then it is possible to have two telephone calls at once. Basic access channels come in two flavors: "B" channels for voice, circuit-data, or packet-data; "D" channels for packet data and call control messages. B channels can alternate between voice and circuit data.

The D channel is always there for call control messages when setting up a Basic Rate Interface. The following arrangements indicate the typical offerings which are available from your telephone company:

- One B channel (at 64 kbps)
- Two B channels
- D channel with packet-data (at 9600 bps)
- One or two B channels and the D channel with packet-data
- Two B-channels and D channel with packet-data

Primary Rate Interfaces (PRIs) come with 23 B channels and one D channel at 64 kbps on a 1.544 Mbps digital line. In PRI, the D channel is only used for call control, packet-data is not supported. "Multirate" calls can also be placed over PRI. Multirate ISDN calling provides wideband channels at 384 kbps, 1536 kbps, or any multiple of 64 kbps ("N by 64").

These BRI or PRI offerings let you set up the communications bandwidth most suitable to your needs. For example, you may use one B channel for voice connections. Over the second channel you may transmit a clear digital bit stream for computer data, video, or images. On the D channel, text-oriented information can be sent economically and reliably using the worldwide X.25 packet data protocols. Examples of all these kinds of calls are included in the particular ISDN solutions in Section 3.

In an ISDN connection, the devices at either end are typically intelligent personal computers or work stations, but they may be intelligent "terminal adapters" handling the communication needs of less sophisticated terminals. To set up calls quickly and transfer information about the call, such as the phone number of the calling party, these intelligent devices send and receive messages to "control" the connection and guide the network's switching computers. For example, a message may be sent between ISDN devices to inform a user (or computer) of an incoming call. This information, running over the D channel, is readily available to intelligent peripherals or network nodes for a wide variety of voice and computer applications without occupying B channel transmission capacity.

A wide variety of ISDN-compatible products for your office or home are available. These devices range from ISDN digital telephones to PC add-in cards that let you expand your local area network connections across town or across the country. Many local telephone companies are making ISDN widely available. Pricing for ISDN services has been established in most locations. And now, these local telephone companies are improving customer service as they make more of their central offices "ISDN ready". The ability to connect these local switches with the long distance carrier of your choice is also being accommodated.

And keep in mind, ISDN works with the voice network and the public Switched 56 data networks already in place. By moving to ISDN, integrated services and networking are achievable on a standardized interface.