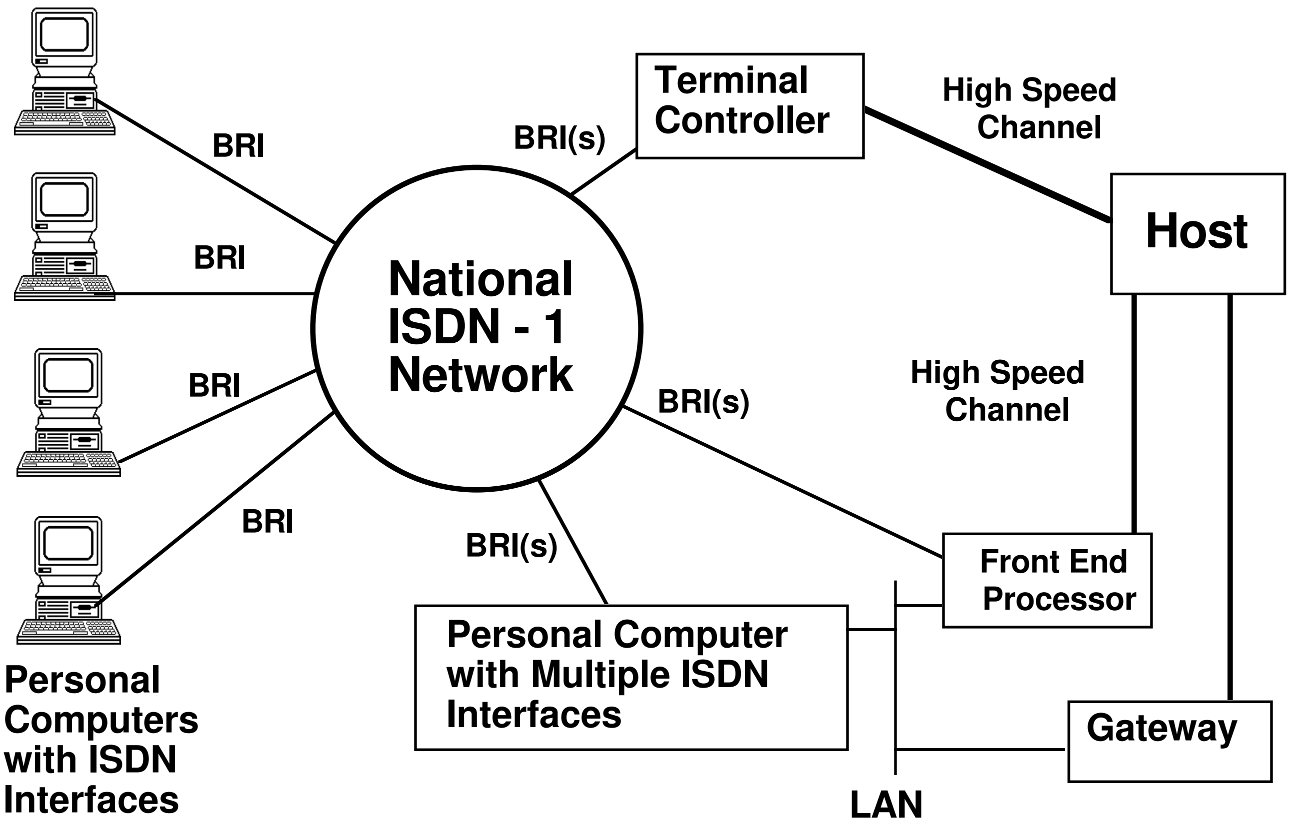
3.1.32 Access to IBM mainframes and compatibles

Users that are geographically separated from their host computer and its resources can access it over ISDN. With remote access, they use the same programs, and can reach the same data. For example, a government agency that maintains databases on a host for administrative purposes, can open a regional office, and connect through ISDN without affecting the host or other major components of the network. Employees at the remote office can have access to all the services of the host.

Configuration: (1, 2, 3, 4, 5)



How It Works:

A personal computer with ISDN can access a host in several ways:

- Connect to a terminal controller with ISDN, that supports 3270 emulation and a channel attachment to the host
- Connect to a Front End Processor (FEP) directly, or through an intermediate LAN, by calling a personal computer with multiple ISDN interfaces. This personal computer also has a LAN interface, and appropriate communications software. The FEP is channel attached to the host, and acts as a router to reach other hosts.
- Connect to a channel-attached gateway through an intermediate LAN, by calling a personal computer with multiple ISDN interfaces.

Obtain Equipment with These Capabilities

Personal Computer with ISDN Interface

- Application software compatible with communication software and applications at the host.
- B channel capabilities:
  - Circuit-data calling on a single B channel.
  - If using NI-1, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- Physical interfaces:
  - RJ-45 connector to NT-1, or integrated NT-1.

Terminal Controller

- Terminal emulation compatible with communications software, personal computers, and host.
- Multiple BRIs (or PRI) to meet network traffic requirements, for each BRI:

  B channel capabilities:
  - Simultaneous circuit-data calling on two B channels.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Support for Multiline Hunt Group as listed under "Network Interfaces to Terminal Controller".
- Physical interfaces:
  - High Speed Channel.
  - RJ-45 connector to NT-1, or integrated NT-1.

Front End Processor

- Communications software compatible with personal computers, network operating system, and hosts.
- Multiple BRIs (or PRI) to meet network traffic requirements, for each BRI:

  B channel capabilities:
  - Simultaneous circuit-data calling on two B channels.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Support for Multiline Hunt Group as listed under "Network Interfaces to FEP".
- BRIs (or PRI) can be supported through external Terminal Adapters with the same capabilities.
- Physical interfaces:
  - High Speed Channel.
  - RJ-45 connector to NT-1, or integrated NT-1.

Personal Computer with Multiple ISDN Interfaces

- Communication software compatible with LAN, Front End Processor, or Gateway for access to Host.
- Multiple BRIs (or PRI) to meet network traffic requirements.

  B channel capabilities for each BRI:
  - Simultaneous circuit-data calling on two B channels.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Support for Multiline Hunt Group as listed under "Network Interfaces to PC with Multiple ISDN Adapters".
- Physical interfaces:
  - Local LAN (e.g., Ethernet or Token Ring).
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to Personal Computers

Network Services Required:

- One BRI. (1B)
- One B channel for circuit-data calls, with circuit-data DN and SPID.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for circuit-data calls (NIIG 3). Other NIIGs which have this functionality include 4, 7, 8, 11, 12, 14-18, 21, 22, and 24-28.
- Parameter Groups for Circuit-Data Features:
  - None required.

Network Interface to Terminal Controller, Front End Processor, or Personal Computers with Multiple ISDN Interfaces

Network Services Required:

- One or more BRIs. (2B)

For each BRI:

- Two B channels for circuit-data calls, with circuit-data DNs and SPIDs.
- Circuit-Data Features:
  - Multiline Hunt Group.

Subscription or Ordering Information:

- This interface is configured for two simultaneous circuit-data calls (NIIG 14). Other NIIGs which have this functionality include 15, 17, 24, 25, and 27.
- Parameter Groups for Circuit-Data Features:
  - A la carte: Multiline Hunt Group

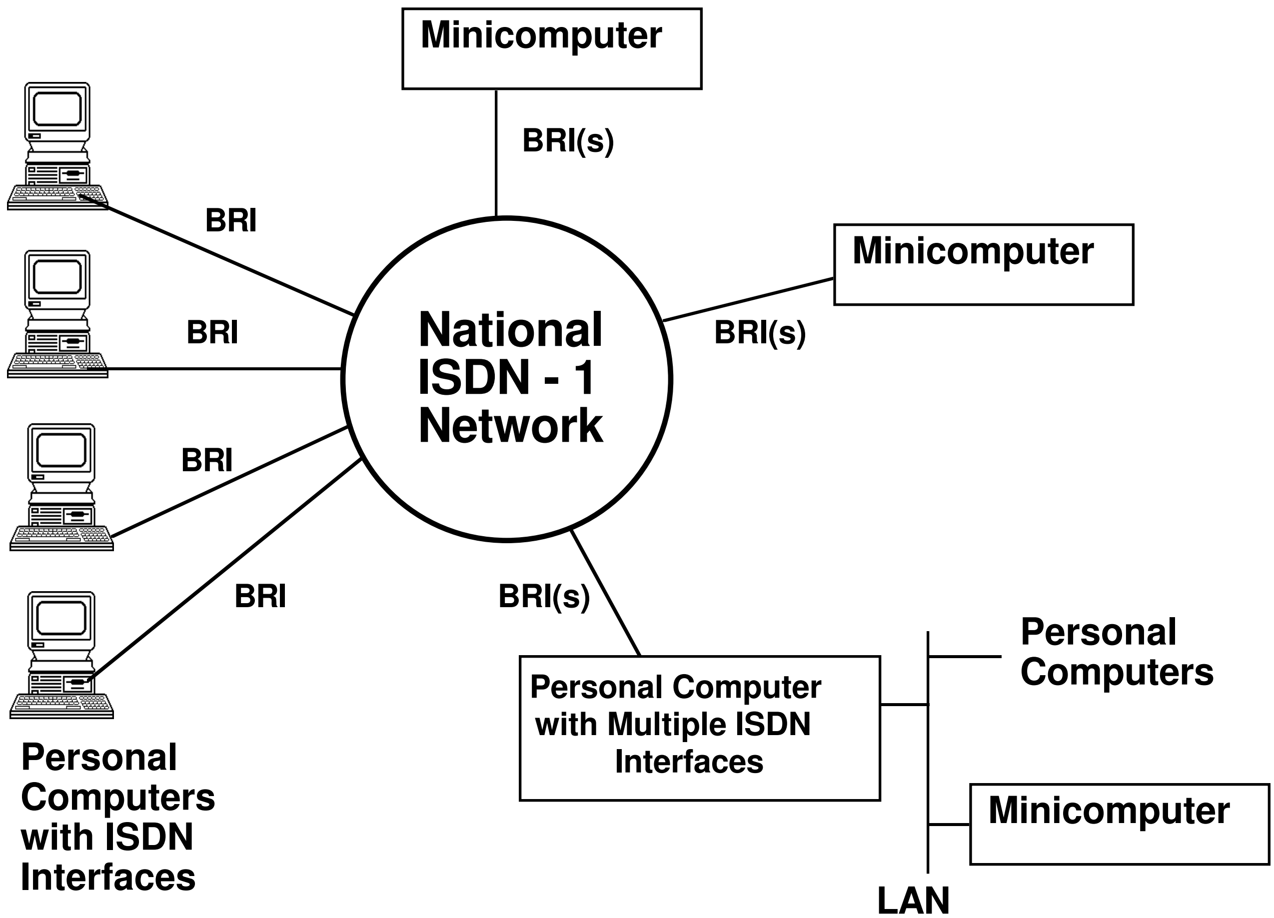
Technical Notes

- Existing Terminal Controllers, Front End Processors, and personal computers can be modified to support ISDN access. Change out modems or CSU/DSUs for the appropriate adapters.
- If external terminal adapters are used, two personal computers can use the same dual data port terminal adapter , placing simultaneous circuit-data calls.
- Personal computers can use a multipoint configuration, attaching two personal computers to one NT-1.
- For further details on Multiline Hunt Group, see Section 5.1.7.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.5 (Circuit-Data Call Setup) and 5.2.1.6 (Voice & Circuit-Data Call Clearing).

3.1.33 Remote access to minicomputers

Regardless of distance, personal computer users can access minicomputer applications through ISDN, just as if they were connected locally. The same emulation software and applications are available. Modem access will also work, but throughput is better with ISDN, and bit error rates are lower.

Configuration: (1, 2, 3, 4, 5)



How It Works:

By placing a circuit data call through its communication software, a personal computer can connect to the mini by directly, or through a personal computer with multiple ISDN interfaces. This personal computer also has a LAN interface, and appropriate communications software. Minis can also communicate directly with a circuit-data connection using the minicomputers' peer communications protocol.

Obtain Equipment with These Capabilities

Personal Computer with ISDN Interface

- Application software compatible with communication software and applications at the host.
- B channel capabilities:
  - Circuit-data calling on a single B channel.
  - If using NI-1, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- Physical interfaces:
  - RJ-45 connector to NT-1, or integrated NT-1.

Minicomputer

- Application software compatible with communication software and with far end.
- Multiple BRIs (or PRI) to meet network traffic requirements, for each BRI:

  B channel capabilities:
  - Simultaneous circuit-data calling on two B channels.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Support for Multiline Hunt Group as listed under "Network Interfaces to Minicomputer".
- Physical interfaces:
  - Local LAN (e.g., Ethernet or Token Ring).
  - RJ-45 connector to NT-1, or integrated NT-1.

Personal Computer with Multiple ISDN Interfaces

- Communication software compatible with LAN for access to Minicomputer

  Multiple BRIs to meet network traffic requirements:

  B channel capabilities for each BRI:
  - Simultaneous circuit-data calling on two B channels.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Support for Multiline Hunt Group as listed under "Network Interface s to Personal Computers".
- Physical interfaces:
  - Local LAN (e.g., Ethernet or Token Ring).
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to Personal Computer with ISDN Adapter

Network Services Required:

- One BRI. (1B)
- One B channel for circuit-data calls, with circuit-data DN and SPID.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for circuit-data calls (NIIG 3). Other NIIGs which have this functionality include 4, 7, 8, 11, 12, 14-18, 21, 22, and 24-28.
- Parameter Groups for Circuit-Data Features:
  - None required.

Network Interface to Minicomputers and Personal Computer with Multiple ISDN Adapters

Network Services Required:

- One or more BRIs. (2B)

For each BRI:

- Two B channels for circuit-data calls, with circuit-data DNs and SPIDs.
- Circuit-Data Features:
  - Multiline Hunt Group.

Subscription or Ordering Information:

- This interface is configured for two simultaneous circuit-data calls (NIIG 14). Other NIIGs which have this functionality include 15, 17, 24, 25, and 27.
- Parameter Groups for Circuit-Data Features:
  - A la carte: Multiline Hunt Group

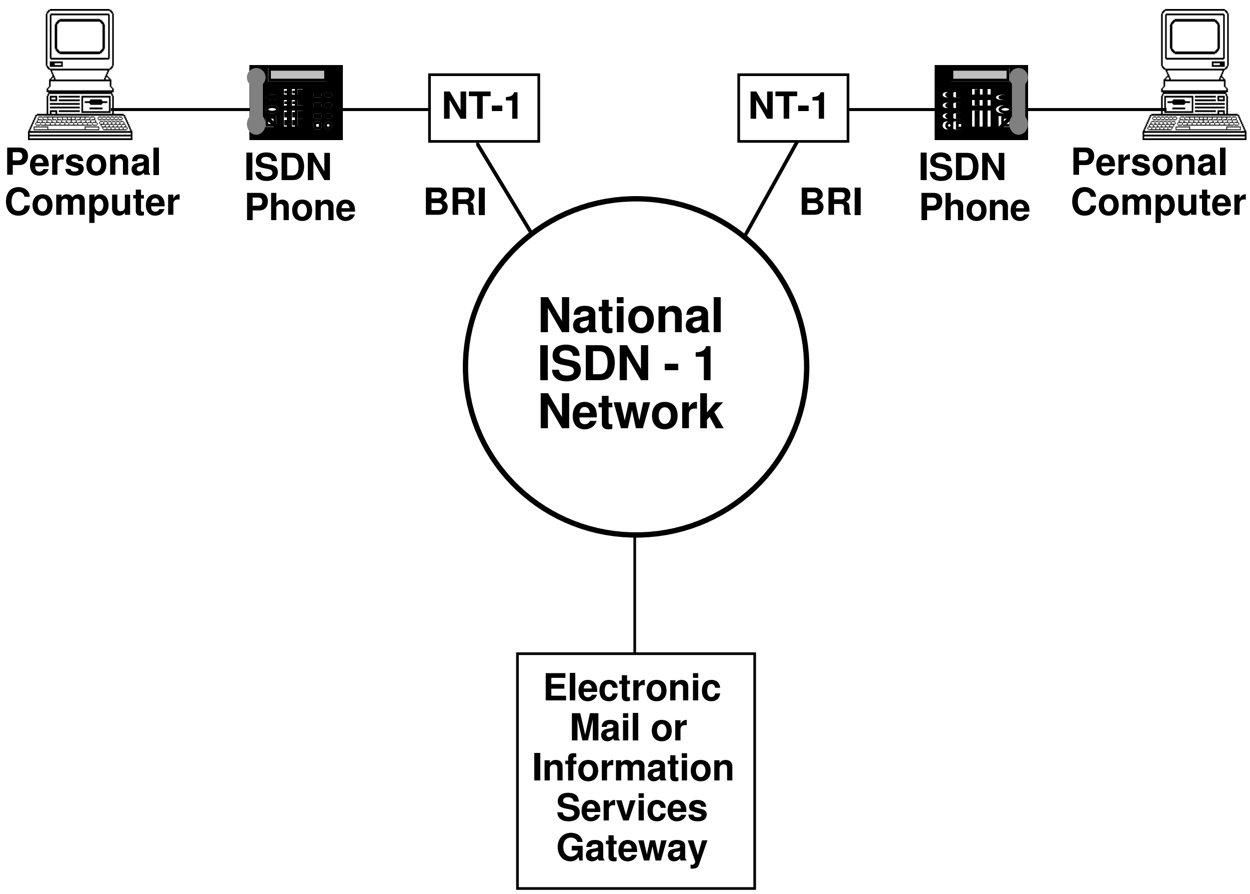
Technical Notes

- Existing minicomputers and personal computers can be modified to support ISDN access. Change out modems or CSU/DSUs for the appropriate adapters.
- If external terminal adapters are used, two personal computers can use the same dual data port terminal adapter , placing simultaneous circuit-data calls.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.5 (Circuit-Data Call Setup) and 5.2.1.6 (Voice & Circuit-Data Call Clearing).

3.1.34 Integrating voice and data communications

ISDN permits the transmission of different kinds of information over a single line at the same time. For instance, during a telephone conversation you may decide to send the other party a file contained in your personal computer. Before you send the file, you may wish to verify some facts via an electronic information service. While you are still talking you can gain access to the information service, verify the information and send the file directly using a file transfer protocol or you can send it via an electronic mail service.

Configuration: (1, **2**, 3, 4)



How It Works:

Using communications software compatible with the Information Services Gateway , the user places a D channel packet-data call to the Information Service Provider's gateway . To the user, this works just as it did with a modem, except the ISDN phone (which replaces the modem) dials a packet-data call. The Phone has "PAD" functionality; it takes a string of characters (asynch) from the personal computer, and sends them out as blocks of characters in X.25 packets.

Obtain Equipment with These Capabilities

Personal Computer

- Application software for information services access and electronic mail, compatible with communications software and far end.
- Serial connection to ISDN Phone (e.g., RS-232, RS-449, V.35).

ISDN Phone

- B channel capabilities:
  - Voice calling on a single B channel.
  - If using NI-1, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
  - Support for the voice features listed under "Network Interface to ISDN Phone".
- D channel capabilities:
  - Packet-data on the D channel.
  - If using NI-1, support for a separate DN (with fixed TEI) will be needed.
  - Packet Assembler & Disassembler (PAD) function, supporting X.3, X.28, X.29.
  - Support for the packet-data features listed under "Network Interface to ISDN Phone".
- Physical interfaces:
  - Serial connection to Personal Computer (e.g., RS-232, RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

E-Mail/Information Services Gateway

- Access to E-Mail and Information Services, compatible with applications on personal computer.
- Multiple BRIs (or PRI) as needed to support usage.
- B channel capabilities for each BRI:
  - Packet-data on two B channels (semi-permanent), with DNs as required.
  - Support for the packet-data features listed under "Network Interface to Gateway".
- Physical interfaces:
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to ISDN Phone

Network Services Required:

- One BRI. (1B+D)
- One B channel for voice calls, with voice DN and SPID.
- Packet-data on the D channel, with packet-data DN and fixed TEI.
- Voice Features:
  - None required.
  - Optional Call Forwarding - Variable, Call Forwarding - Interface Busy, Call Forwarding - Don't Answer, and Message Waiting Indicator.
  - Optional Flexible Calling (includes 3-Way Conference Calling, Hold, Transfer, and Drop).
  - Optional Calling Number Identification Services.
- Packet-Data Features:
  - Logical Channels: 1 Two-Way LC.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 128 Octets.
  - Packet Window Size: 2.
  - Flow Control Parameter Negotiation (window size and packet size).
  - Throughput Class Negotiation.

Subscription or Ordering Information:

- This interface is configured for simultaneous voice calls and packet-data on the D channel (NIIG 6). Other NIIGs which have this functionality include 8, 20-23, 25, 27, and 28.
- Parameter Groups for Optional Voice Features
  - NIPG 2 - Advanced Call Forwarding for Voice.
  - NIPG 3 - Flexible Calling for Voice.
- Parameter Groups for Packet-Data Features:
  - NIPG 7 - Basic D Channel Packet-Data. In addition request Flow Control Parameter Negotiation (window size and packet size), and Throughput Class Negotiation.

Network Interface to Gateway

Network Services Required:

- One or more BRI. (2B)

For each BRI:

- Two B channels for packet-data (semi-permanent), with packet-data DN for each B channel.
- Packet-Data Features for each channel:
  - Multiline Hunt Group
  - Logical Channels: multiple two-way LCs.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 256 Octets.
  - Packet Window Size: 2.

Subscription or Ordering Information:

- This interface is configured for packet-data calls on two B channels (NIIG 19).
- Parameter Groups for Packet-Data Features:
  - NIPG 9 - Basic B channel packet features. Select number of Logical Channels.
  - A la carte: Multiline Hunt Group.

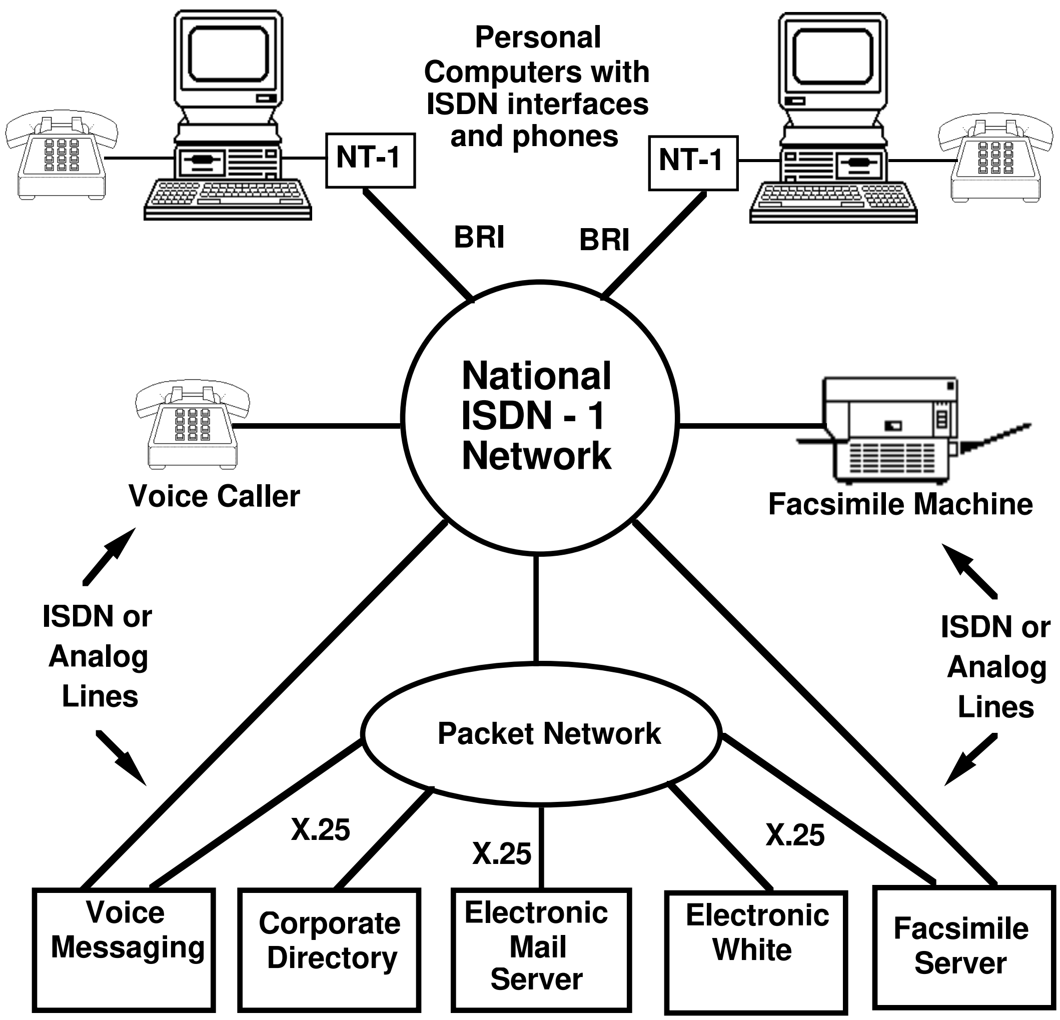
Technical Notes

- This example shows that the packet-data B channels in the Multiline Hunt Group terminate directly into the Gateway. It is also possible that the packet-data B channels could terminate on an ISDN Terminal Adapter, which in turn would connect to the ports on the Communications Server using conventional X.25 interfaces (e.g. RS-449 or V.35 at the physical level).
- In some cases, the packet-data configuration of the Phone and the Gateway will not be the same. In these cases, it will be more likely that calls are completed if the Phone and the Communications Server also support Throughput Class Negotiation & Flow Control Parameter Negotiation.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), and 5.2.1.6 (Voice & Circuit-Data Call Clearing), and 5.2.1.7 (Packet-Data Call Setup & Clearing)

3.1.35 Integrated communications and messaging

ISDN can provide simplified management of a person's communication and messaging services . ISDN users can have instantaneous access to remote corporate and regional directories , can search through listings, and place voice calls, send electronic mail, or send faxes to people whose listings have appropriate addresses. Conference calls can be easily set up by selecting people from the various directories or entering their numbers manually. ISDN users receive visual notification of new messages which are stored for the them in network voice mail, electronic mail , and fax mail servers. Screen based control of network services such as voice mail allows users to selectively review and respond to their messages. Users with end-to-end ISDN benefit from screen transfer to other users at rates up to 64 kbps.

Configuration: (<u>**1**</u>,4)



How It Works:

This solution takes advantage of ISDN's integrated voice and data to provide a complete integrated messaging system. The user's interface lists waiting messages of all media, supports responses to the appropriate systems as well. The distributed application uses D channel packet-data to exchange envelope information and commands with the different systems, and to reach on-line directories.

Obtain Equipment with These Capabilities

Personal Computer with ISDN Interface

- Application software compatible with communication software and far end.
- B channel capabilities:
  - Simultaneous voice and circuit-data calling.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Support rate adaptation for rates lower then 64 kbps. For example, asynchronous communications may be rate adapted using V.120.
  - Support for the voice features listed under "Network Interface to Personal Computer with ISDN Adapter".
  - Support for the circuit-data features listed under "Network Interface to Personal Computer with ISDN Adapter".
- D channel capabilities:
  - Packet-data on the D channel.
  - If using NI-1, support for a separate DN (with fixed TEI) will be needed.
  - Support for the packet-data features listed under "Network Interface to Personal Computer with ISDN Adapter".
- Physical interfaces:
  - Analog phone jack.
  - RJ-45 connector to NT-1, or integrated NT-1.

Electronic Mail Server

- Support E-mail with a Personal Computer using an X.25 network; store and forward the E-mail to any attached network.
- Ability to notify Computer of incoming E-mail via X.25

Voice Messaging System (VMS)

- Ability to receive Voice calls over ISDN or non-ISDN lines and store a message for the appropriate user.
- Ability to notify called Computer, via X.25 , that a Voice message has been received.

Facsimile Server

- Ability to send and receive voice calls over ISDN, or modem calls over non-ISDN lines
- Ability to receive outgoing facsimile messages from computer, and transmit these messages to FAX machines using Group 3 facsimile.
- Ability to receive incoming facsimile messages from Group 3 FAX machines, and transmit these messages to Computer using circuit-data

Corporate Directory & Electronic White Pages

- Support end user access and respond to user queries on Name, Address, and Phone Number information

Request These Capabilities From ISDN Service Provider

Network Interface to Personal Computer with ISDN Adapter

Network Services Required:

- One BRI. (2B+D)
- One B channel for voice calls, with voice DN and SPID.
- One B channel for circuit-data calls, with circuit-data DN and SPID.
- Packet-data on the D channel, with packet-data DN and fixed TEI.
- Voice Features:
  - Call Forwarding - Variable.
  - Call Forwarding - Interface Busy.
  - Call Forwarding - Don't Answer.
  - Flexible Calling (includes 3 Way Conference Calling, Hold/Retrieve, Transfer, and Drop).
  - Calling Number Identification Services.
- Circuit-Data Features:
  - Calling Number Identification Services
- Packet-Data Features:
  - Logical Channels: At Least 8 Two-Way LC.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 128 Octets.
  - Packet Window Size: 2.

Subscription or Ordering Information:

- This interface is configured for simultaneous voice, circuit-data, and D channel packet-data calls (NIIG 21). Other NIIGs which have this functionality include 22, 25, and 27.
- Parameter Groups for Voice Features:

- NIPG 2 - Advanced Call Forwarding for Voice. Message Waiting Indicator not required.
- NIPG 3 - Flexible Calling for Voice.
- A la carte: Calling Number Identification Services

• Parameter Groups for Circuit-Data Features:
  - A la carte: Calling Number Identification Services
  - Parameter Groups for Packet-Data Features:
  - NIPG 7 - Basic D Channel Packet-Data. Request 8 Logical Channels.

Network Interfaces To Electronic Mail Server

• Conventional data interfaces to X.25 network (see Technical Notes)

Network Interfaces To Voice Messaging System

• Appropriate number of voice lines & ISDN lines for incoming Voice calls, using 1 DN with a Hunt Group

• Conventional data interface to X.25 network (see Technical Notes)

Network Interfaces To Facsimile Server

• Appropriate number of voice lines & ISDN lines for outgoing Group 3 Facsimile calls

• Conventional data interface to X.25 network (see Technical Notes)

Network Interface To Corporate Directory & Electronic White Pages (EWP)

• Conventional data interface to X.25 network (see Technical Notes)

Technical Notes

• Incoming Voice calls are offered to the ISDN Personal Computer/Phone. Call Forwarding - Interface Busy & Call Forwarding - Don't Answer features direct call to VMS if Phone is busy or doesn't answer calls.

• VMS notifies Personal Computer of available Voice messages using D Channel X.25 call. User can then call into VMS using Phone to retrieve messages.

• Electronic Mail Server notifies Personal computer user of available E-Mail using D Channel X.25 call. User can then call into E-Mail server using Personal computer to retrieve messages and to send messages to other parties.

• User calls into Facsimile Server using D Channel X.25 call, and uploads message file and destination FAX number to Server. Server transmits file as Group 3 FAX to destination number over outgoing Voice line or ISDN line.

• Remote Group 3 Facsimile Machine calls into Facsimile Server over incoming Voice or ISDN line, and transmits Group 3 FAX message to server. Server determines destination number of ISDN Personal Computer using the called number from Group 3 FAX call, and notifies Personal Computer of available FAX using D Channel X.25 call. User can place a circuit data call from Personal Computer to Server (using V.120 adaptation) and retrieve FAX from Server.

• User calls into Corporate Directory or Electronic White Pages using D Channel X.25 call, and scans directory for desired Names, Addresses, Phone and FAX Numbers. Upon retrieval of information, user can use Personal Computer to place Phone call (on behalf of Phone) to retrieved Phone Number, or to send outgoing FAX to retrieved FAX number.

• Support of 8 X.25 LCs on the D Channel allows the user to have simultaneous access to multiple data endpoints (VMS, E-Mail Server, FAX Server, Electronic White Pages, etc.). The user can also have simultaneous access to multiple directories if the Personal Computer has the appropriate applications software to access each one of those systems.

• Each "Conventional data interface to X.25 network" is typically a non-ISDN data line running at 9600 bps or 56 Kbps using an RS-449 or V.35 interface. Each of the end devices (VMS, E-Mail Server, Fax Server, Directory, or EWP) could also be served by an "ISDN data interface to the ISDN X.25 Packet Handler", which would involve either an ISDN D Channel link running at 9600 bps or an ISDN B Channel link running at 64 Kbps. (The D Channel or B Channel TA in these cases would still support the conventional RS 449 or V.35 interface.)

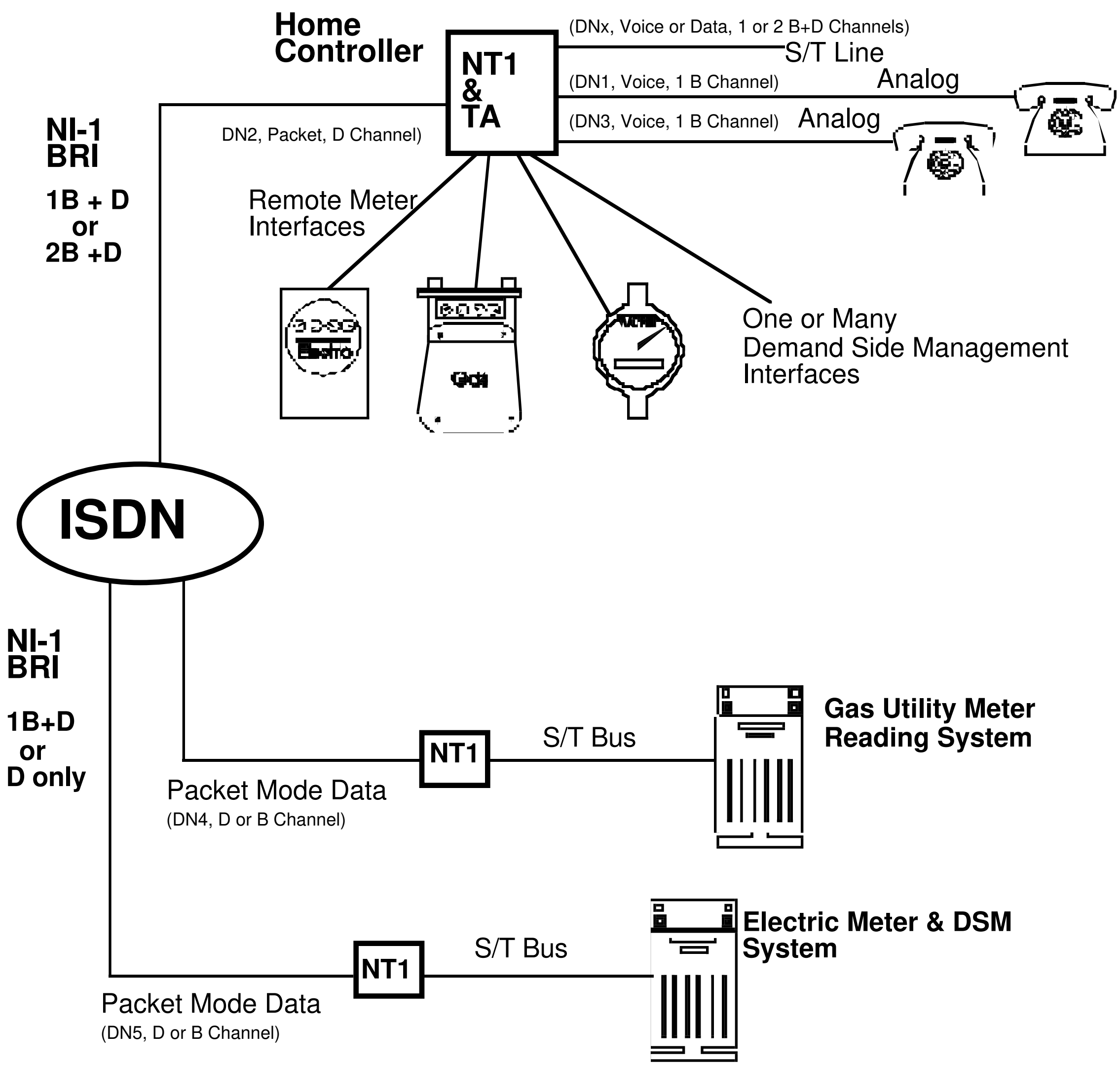
• For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.

• For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), 5.2.1.5 (Circuit-Data Call Setup), and 5.2.1.6 (Voice & Circuit-Data Call Clearing), 5.2.1.7 (Packet-Data Call Setup & Clearing) and 5.2.1.8 (Packet-Data Fast Select Setup & Clearing).

3.1.36 Automatic utility meter reading

ISDN can be used to automatically read utility meters without sending a utility employee to look at the meter. This ISDN connection can also be used to implement Demand Side Management which controls major residential and commercial loads, enabling the utility to balance supply and demand. Meter reading and Demand Side Management are low volume D channel packet applications that will not interfere with the customer's ability to make or receive ISDN voice or data calls on the same line. The customer can even use the D channel for packet-switched services with little noticeable degradation in performance due to the utility application.

Configuration:



How It Works:

The home controller and meter reading systems communicate using D channel packet-data. Meter reading usage is sent from remote meter interfaces using an application protocol established by the utility. The home can use the B channels for voice, or circuit-data.

Obtain Equipment with These Capabilities

Home Controller

- A Meter Reading application
- One or more Demand Side Management interfaces
- A Demand Side Management application
- B channel capabilities:
  - Voice calling on a single B channel.
  - If using NI-1, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- D channel capabilities:
  - Packet-data on the D channel.
  - If using NI-1, support for a separate DN (with fixed TEI) will be needed.
  - Support for the packet-data features listed under "Network Interface to Home Controller".
- Physical interfaces:
  - Analog phone jack.
  - Up to 3 serial remote meter reading interfaces
  - RJ-45 connector to NT-1, or integrated NT-1.

Utility Meter Reading System

- A Meter Reading application
- A Demand Side Management application (as needed)
- As many BRIs as needed to support activity.
- B channel capabilities for each BRI:
  - Packet-data on two B channels (semi-permanent)
  - Support for the packet-data features listed under "Network Interface to Meter Reading System".
- Physical interfaces:
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to Home Controller

Network Services Required:

- One BRI. (1B+D)
- One B channel for voice calls, with voice DN and SPID.
- Packet-data on the D channel, with packet-data DN and fixed TEI.
- Voice Features:
  - None required.
- Packet-Data Features:
  - Logical Channels: As many as required for utility meter customers.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 128 Octets.
  - Packet Window Size: 2.

Subscription or Ordering Information:

- This interface is configured for simultaneous voice calls and packet-data on the D channel (NIIG 6). Other NIIGs which have this functionality include 8, 20-23, 25, 27, and 28.
- Parameter Groups for Voice Features:
  - None required.
- Parameter Groups for Packet-Data Features:
  - NIPG 7 - Basic D Channel Packet-Data. Select number of Logical Channels.

Network Interface to Utility Meter Reading System

Network Services Required:

- One or more BRI. (2B)

For each BRI:

- Two B channels for packet-data (semi-permanent), with packet-data DN for each B channel.
- Packet-Data Features for each channel:
  - Multiline Hunt Group
  - Logical Channels: multiple two-way LCs.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 128 Octets.
  - Packet Window Size: 2.

Subscription or Ordering Information:

- This interface is configured for simultaneous packet-data calls on two B channels (NIIG 19). Other NIIGs which have this functionality include 29.
- Parameter Groups for Packet-Data Features:
  - NIPG 9 - Basic B channel packet features. Select Logical Channels and Maximum User Data Field = 128.
  - A la carte: Multiline Hunt Group.

Technical Notes

- Voice calls can be placed and answered using the B channel while Meter Reading and Demand Side Management information is exchanged on the D Channel.

Home Controller Options

- Optional Voice services such as Calling Number Identification Services.
- Optional packet-data services:
  - More than 4 Logical Channels (LCs):

    e.g. 6 LCs for 3 Meters & 3 Demand Side Management Devices
  - X.25 Permanent Virtual Circuits (PVCs) in place of X.25 Switched Virtual Circuits (SVCs)
  - Reverse Charging for calls to Meter Reading System. (Not part of NIPG 7.)
- Optional passive bus S/T interface. (Equipment on this bus should be transparent to the operation of the HOME CONTROLLER and may use any valid National ISDN-1 service.) May be used in place of second phone.

Meter Reading/Demand Side Mgmt. System Options

- Optional packet-data Services:
  - Support D Channel instead of B Channel (depends on volume throughput requirements)
  - X.25 PVCs in place of X.25 SVCs
  - Reverse Charging Acceptance for calls from Home Controllers

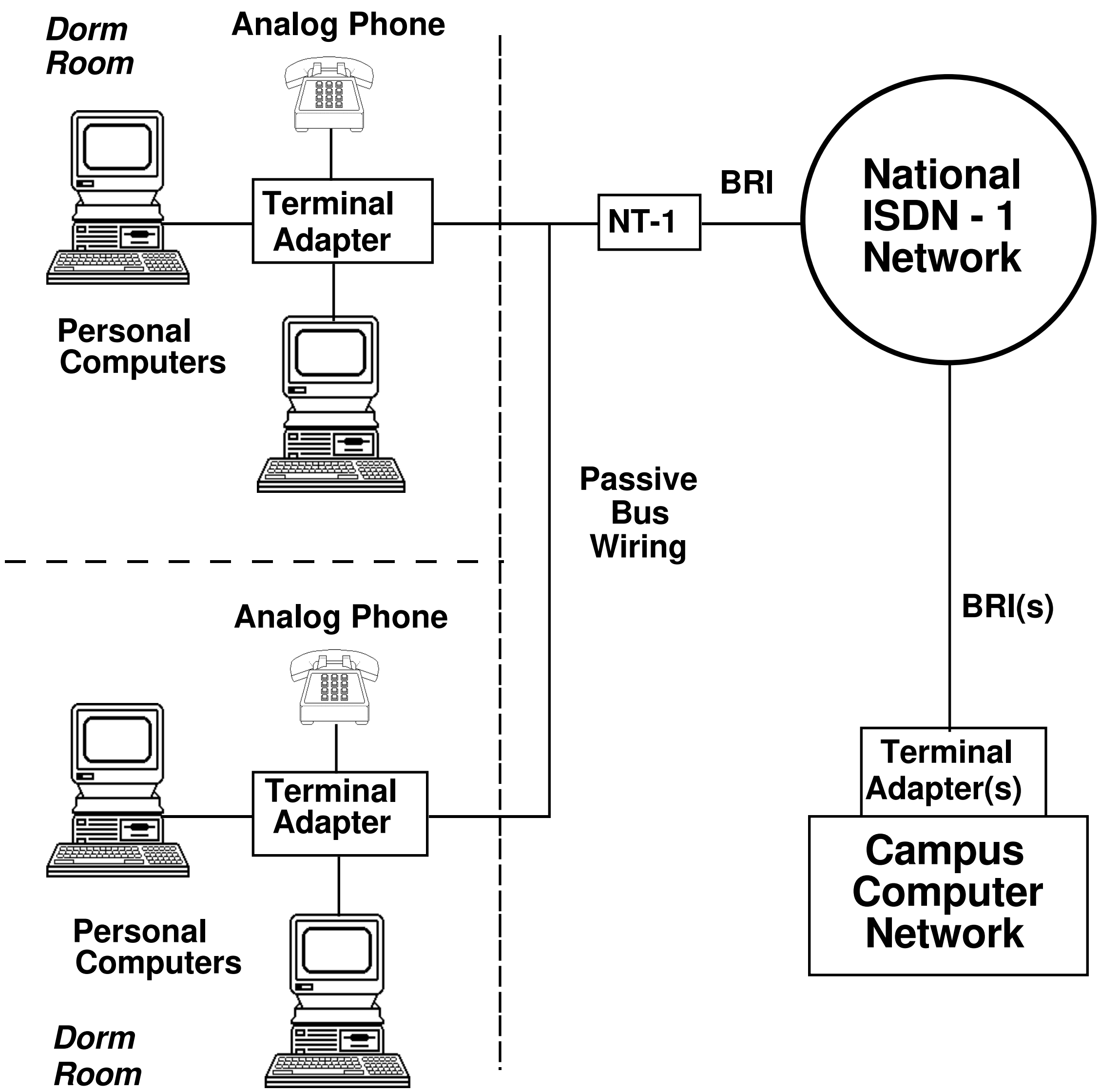
General Options

- The Configuration diagram and Capabilities assume that the packet-data B Channel terminates directly into the Meter Reading System. The packet-data B Channel could also terminate on an ISDN Terminal Adapter, which in turn would connect to the Meter Reading System using a conventional X.25 interface (e.g. RS-449 or V.35).
- For more information on Multiline Hunt Group, see Section 5.1.7.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), and 5.2.1.6 (Voice & Circuit-Data Call Clearing), and 5.2.1.7 (Packet-Data Call Setup & Clearing) .

3.1.37 University dormitory

ISDN provides the ability to provide the cost effective voice and data communications that is required by today's college and university students. Typically two students share one room. They each need a data communication connection for their personal computer and they share a single voice telephone. A single ISDN line using a passive bus configuration will support two rooms if D channel packet switching is used for the data connections.

Configuration: (3, 4)



How It Works:

Each room has a TA with two data ports and an analog phone port. Two rooms share a 2B+D interface in a "passive bus" arrangement. For data calls, the personal computers place D-channel packet-data calls through their communications software using PAD s in the TAs. Voice calls are also placed through the TAs.

Obtain Equipment with These Capabilities

Personal Computers in Dorm Rooms

- Applications software, compatible with Communications Software and far end.
- Compatible data interface to Terminal Adapter (e.g., RS-232, RS-449, V.35)

Terminal Adapters for Dorm Rooms

- B channel capabilities:
  - Voice calling on a single B channel.
  - If using NI-1, support for one Directory Number (DN) and Service Profile ID (SPID) will be needed.
- D channel capabilities:
  - Packet-data on the D channel.
  - Support for two DNs (with fixed TEIs)
  - Packet Assembler & Disassembler (PAD) function, supporting X.3, X.28, X.29.
  - Support for the packet-data features listed under "Network Interface to Terminal Adapter".
- Physical interfaces:
  - Analog phone jack.
  - Two Serial connections to Personal Computers (e.g., RS-232, RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Terminal Adapters to Campus Computer Network

- Multiple BRIs as needed to support usage, may be one or more TAs.
- B channel capabilities for each BRI:
  - Packet-data on two B channels (semi-permanent), with DNs as required.
  - Support for the packet-data features listed under "Network Interface to Terminal Adapters for Campus Network".
- Physical interfaces:
  - Compatible data interface to Campus Computer Network (e.g., X.25, X.28)
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to ISDN Terminal Adapters for Dorm Rooms

Network Services Required:

- One BRI. (2B+D)
- Two B channels for voice calls, with voice DNs and SPIDs.
- Packet-data on the D channel, with four packet-data DNs and fixed TEIs.
- Voice Features:
  - None required.
- Packet-Data Features:
  - Logical Channels: At Least 1 Two-Way LC.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 128 Octets.
  - Packet Window Size: 2.
  - Throughput Class Negotiation.
  - Flow Control Parameter Negotiation.

Subscription or Ordering Information:

- This interface is configured for two simultaneous voice calls and packet-data on the D channel (NIIG 20). Other NIIGs which have this functionality include 22 and 27.
- Parameter Groups for Voice Features:
  - None required.
- Parameter Groups for Packet-Data Features:
  - NIPG 7 - Basic D Channel Packet-Data. Add Throughput Class and Flow Control Parameter Negotiation.

Network Interface to ISDN Terminal Adapters for Campus Computer Network

Network Services Required:

- One or more BRI. (2B)

For each BRI:

- Two B channels for packet-data (semi-permanent), with packet-data DN for each B channel.
- Packet-Data Features for each channel:
  - Multiline Hunt Group
  - Logical Channels: multiple two-way LCs.
  - Throughput Class : 9600 bps.
  - Maximum User Data Field: 256 Octets.
  - Packet Window Size: 2.

Subscription or Ordering Information:

- This interface is configured for B channel packet-data calls (NIIG 19). Other NIIGs which have this functionality include 29.
- Parameter Groups for Packet-Data Features:
  - NIPG 9 - Basic B channel packet features.
  - A la carte: Multiline Hunt Group.

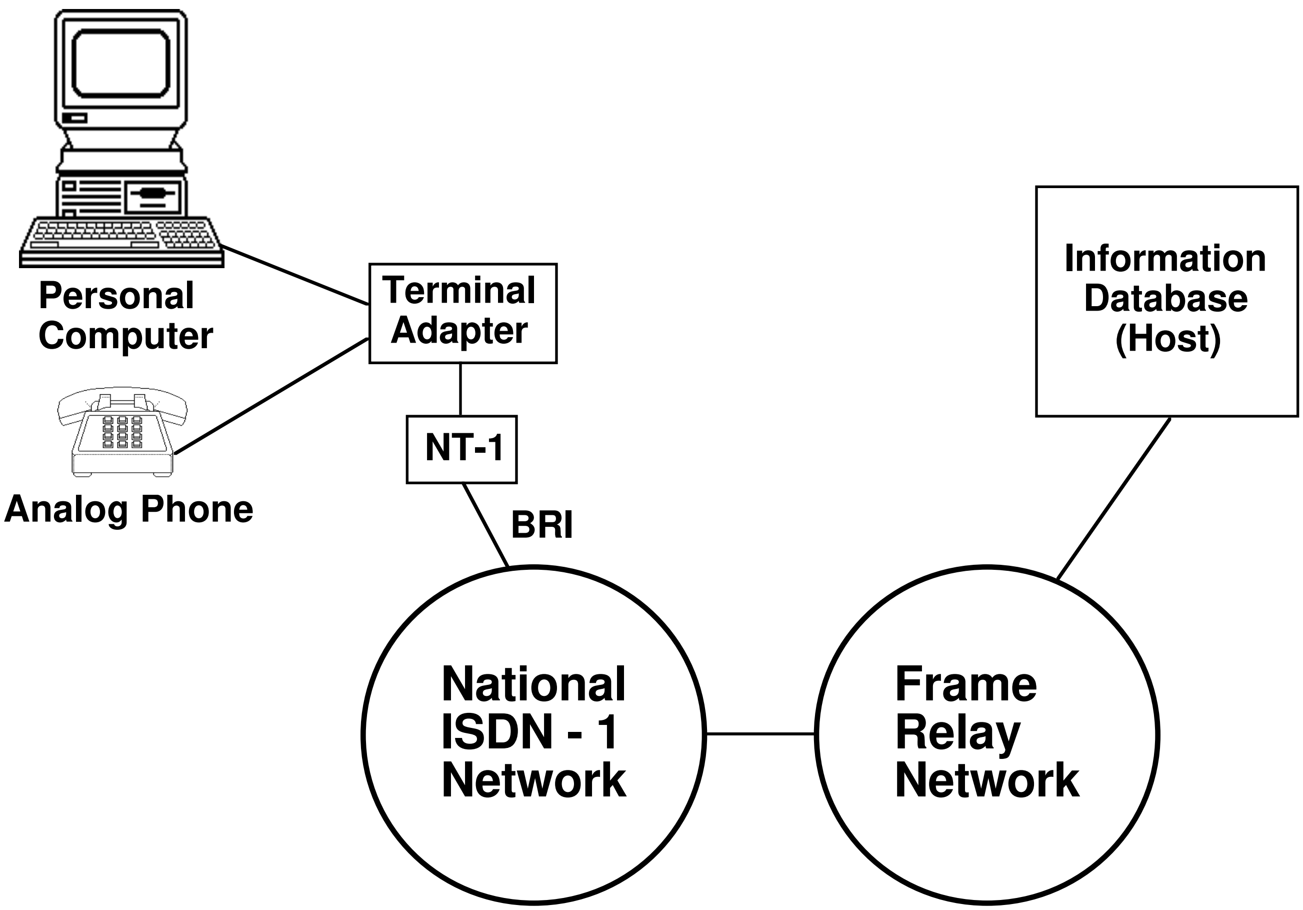
Technical Notes

- A single 2B+D NI-1 BRI serves two Dormitory Rooms and six pieces of user equipment (two phones and four data terminals). If each Dorm Room houses 3 students, one NI-1 BRI can serve two Dormitory Rooms and eight pieces of user equipment (2 phones and six data terminals) . Each Room has an additional (third) Computer in this case.
- Each Dorm Room TA uses one DN for Voice calls to and from the Room Phone. Each Dorm Room TA also uses another DN for packet-data calls to and from the first Computer in that Room, and yet another DN for packet-data calls to and from the second Computer in that Room.
- All TAs (Room & Campus Computer) should support Throughput Class and Flow Control Parameter Negotiation, to allow the "throughput" of the X.25 calls to be adjusted downward from 9600 bps when 2 or more Computers use the D Channel at once.
- When only one Computer uses the D Channel, the Throughput Class for that Computer must be 9600 bps or lower. When two or three Computers use the D Channel, the Throughput Class for each Computer must be 4800 bps or lower for equal sharing of continuous traffic on the channel. When four (or five or six) Computers use the D Channel, the Throughput Class for each Computer must be 2400 bps or lower for equal sharing of continuous traffic on the channel.
- For additional information on Multiline Hunt Group, see 5.1.7.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), and 5.2.1.6 (Voice & Circuit-Data Call Clearing), and 5.2.1.7 (Packet-Data Call Setup & Clearing).

3.1.38 Access to frame-relay services

ISDN can be used to provide access to a private frame relay network at speeds up to 64 kbps. This capability extends frame relay access to for users that may not be in the immediate vicinity of a frame relay server. Frame relay is used primarily in a "Permanent Virtual Circuit" arrangement today; this solution extends the PVC through a National ISDN - 1 network to provide a single access line for the end user to frame relay and, on another channel within the access line, to other ISDN services.

Configuration: (1, 2, <u>**3**</u>, 4)



How It Works:

Applications on the personal computer utilize frame relay through frame relay "framing" functions, or FRAD, for Frame Assembler and Disassembler. A B channel on the user's BRI can be permanently assigned, or "nailed up", to a port on a gateway to the private frame relay network.

Obtain Equipment with These Capabilities

Personal Computer

- Application software compatible with communications software and far end.
- Serial connection to Terminal Adapter (e.g., RS-232, RS-449, V.35).

Terminal Adapter

- Provide "Frame Assembler & Disassembler" ("FRAD") function, assemble Personal Computer data into Frame Relay frames and disassemble Frame Relay frames into Personal Computer data
- Support at least 1 Frame Relay Permanent Virtual Circuit (PVC) on a semi-permanent circuit-data B Channel
- Maintain one nailed-up circuit-data connection through ISDN to Frame Relay Network, using one circuit-data B Channel (Semi-Permanent)
- Support circuit-data access at 56 kbps or 64 kbps over nailed-up connection. (Use 56k if 64k is not available to Frame Relay Net.)
- PVC and Frame format in accordance with ANSI T1.618, Core Aspects of Frame Relay, & Q.922, Annex A
- B channel capabilities:
  - Voice calling on a single B channel.
  - Circuit-data (semi-permanent) on a single B channel.
  - Support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
- Physical interfaces:
  - Analog phone jack.
  - Serial connection to Personal Computer (e.g., RS-232, RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Frame Relay Network

- Implement at least 1 Frame Relay PVC between NI-1 Network interface and data interface serving Host
- PVCs and Frame format in accordance with ANSI T1.618, Core Aspects of Frame Relay, & Q.922, Annex A

Information Database (Host)

- Application for user data base access
- Provide "FRAD" function, assemble Host data into Frame Relay frames and disassemble Frame Relay frames into Host data
- Compatible interface to Frame Relay Network (e.g., V.35)
- Support at least 1 Frame Relay PVC on Frame Relay Network Interface
- PVC and Frame format should follow ANSI T1.618, Core Aspects of Frame Relay, & Q.922, Annex A

Request These Capabilities From ISDN Service Provider

Network Interface to ISDN Terminal Adapter

Network Services Required:

- One BRI. (2B)
- One B channel for voice calls, with voice DN and SPID.
- One B channel for semi-permanent circuit-data calls, with DN.
- Voice Features:
  - None required.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for simultaneous voice calls and semi-permanent circuit-data calls. There is no corresponding NIIG.
- Parameter Groups for Voice Features:
  - None required.
- Parameter Groups for Circuit-Data Features:
  - None required.

Network Interface to Frame Relay Network

Network Services Required:

- One or more BRI. (2B)

For each BRI:

- Two B channels for semi-permanent circuit-data calls, with two DNs.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for semi-permanent circuit-data calls. There is no corresponding NIIG.
- Parameter Groups for Circuit-Data Features:
  - None required.

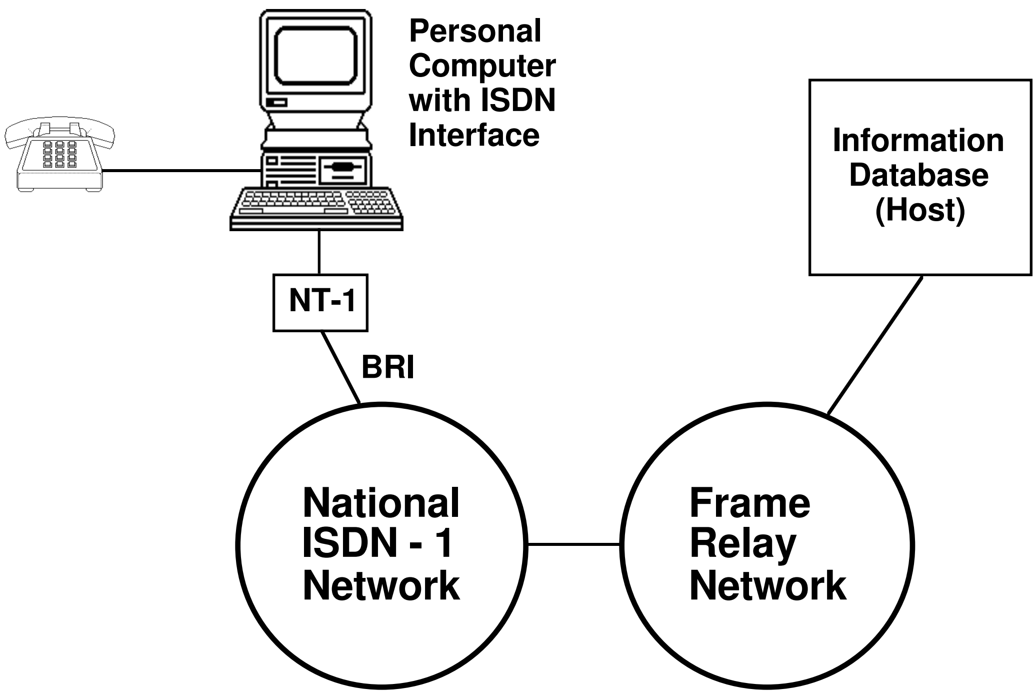
Technical Notes

- Note that the 56 or 64 kbps B Channel is semi-permanently connected to the Frame Relay Network, no ISDN signaling is used for this connection. "Semi-Permanent" means that the connection can be taken down for administrative & maintenance purposes when necessary. This capability is outside the scope of the NI-1 feature specifications, but may be provided by an NI-1 network.
- The Semi-Permanent circuit-data connection runs between the Computer interface on the TA and an ISDN Access Port on the Frame Relay Network
- Note that Channel B2 is not used for any circuit-data calls , since it is reserved for the Nailed-Up circuit-data connection. The DN assigned to Channel B2 channel is also not used for any circuit-data calls, but may be used for billing the end users for the Nailed-Up circuit-data connection. (Some implementations may allow billing for the circuit-data connection without requiring that the DN be assigned,)
- ANSI T1.618, *Core Aspects of Frame Protocol for Use With Frame Relay,* should be consulted for further information on the specifics of Frame Relay PVCs.
- Note also that the Frame Relay Network used in this Guide could actually be a Frame Handler within the National ISDN-1 Network in certain implementations.
- For detailed Signaling Flow Diagrams for Voice calls used with this application, see Sections 5.2.1.4 (Voice Call Setup) and 5.2.1.6 (Voice and Circuit-Data Call Clearing). (Since the Nailed-Up B Channel uses no ISDN signaling, Circuit-Data Call Setup and Circuit-Data Call Clearing do not apply.)

3.1.39 Switched access to frame relay services

ISDN can be used to provide access to private frame relay networks at speeds up to 128 kbps. This capability can be used to extend access to offices or homes that cannot get frame relay service. This solution provides a way for ISDN customers to dial in to private corporate frame relay networks as necessary without dedicating a B channel (or both B channels) for this application.

Configuration: (**1**, 2, 3, 4)



How It Works:

The ISDN subscriber places a circuit-data call to the ISDN Frame Relay interworking unit (not shown). This functionality may be provided by the ISDN service provider, the Frame Relay service provider, or for work at home situations, may be implemented in equipment at the corporate site. This solution assumes that the interworking unit has ports into the Frame Relay network for which Permanent Virtual Circuits (PVCs) have been previously established to the host (or hosts) with the corporate applications. The interworking unit validates the caller, and optionally allows another circuit-data call to be inverse multiplexed for 128 (112) kbps access. The ISDN user's terminal equipment then communicates with the host(s) using Frame Relay protocols across the ISDN network. The interworking unit routes frames to and from the hosts using the Data Link Connection Identifiers (DLCIs) which are known by the ISDN user and correspond to the destination host(s).

Obtain Equipment with These Capabilities

Personal Computer with ISDN Interface

- Application software compatible with communication software and far end.
- ISDN Adapter should provide Frame Assember & Disassembler (FRAD) functions compatible with interworking unit and Frame Relay Network. Relevant standards are ANSI T1.618 and Q.922, Annex A.
- B channel capabilities:
  - Simultaneous voice and circuit-data calling.
  - Simultaneous circuit-data calling on two B channels.
  - For NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
  - Combine two 64 kbps signals to/from the BRI into 128 kbps signal in a way that is compatible with far end. (BONDING, H.221.)
- Physical interfaces:
  - Analog phone jack.
  - RJ-45 connector to NT-1, or integrated NT-1.

Host Computer

- Application software for user database access compatible with communications software and far end.
- Frame Assember & Disassembler (FRAD) functionality compatible with interworking unit and Frame Relay Network. Relevant standards are ANSI T1.618 and Q.922, Annex A. Serial connection to external FRAD may be necessary (e.g., V.35).

Request These Capabilities From ISDN Service Provider

Network Interface to Personal Computer with ISDN Adapter

Network Services Required:

- One BRI. (2B)
- Two B channels for alternate voice and circuit-data, with alternate voice and circuit-data DNs and SPIDs.
- Voice Features:
  - None required.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for two simultaneous alternate voice and circuit-data calls (NIIG 17). The only other NIIG with this functionality is 27.
- Parameter Groups for Voice Features:
  - None required.
- Parameter Groups for Circuit-Data Features:
  - None required.

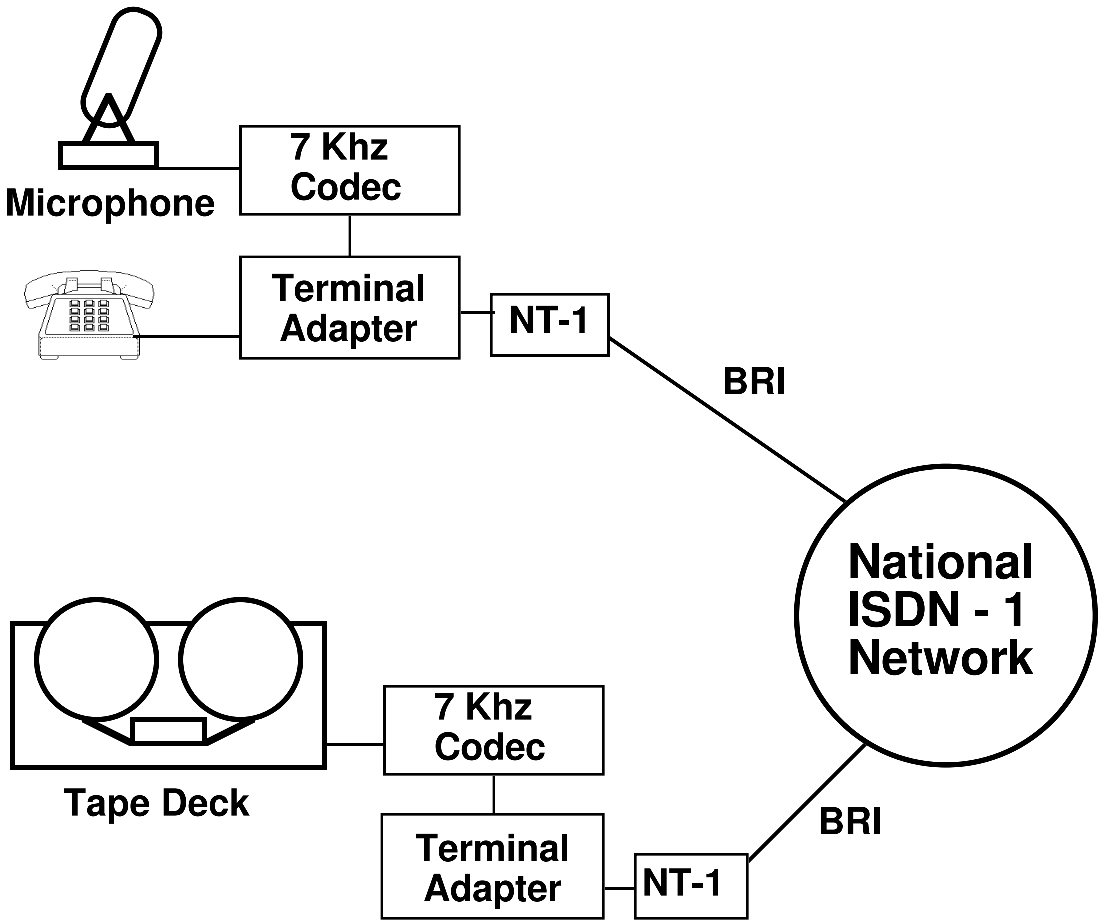
Technical Notes

- For details on NIUF ISDN Parameter Group (NIPG) and NIUF ISDN Interface Group (NIIG) Ordering, see Section 5.1.11
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.4 (Voice Call Setup), 5.2.1.5 (Circuit-Data Call Setup) and 5.2.1.6 (Voice & Circuit-Data Call Clearing).

3.1.40 High fidelity voice transmission systems

ISDN may be used to support broadcast quality audio. This capability is useful to radio stations when they want to broadcast from a remote site.

Configuration:



How It Works:

Users place a 64 kbps circuit-data call between TAs. When the codecs are brought up and the receiving tape deck is on, then the reporter can talk. Codecs encode and decode an analog signal (in this case speech) into digital format. The digitized speech is carried across the all-digital ISDN network without corruption.

Obtain Equipment with These Capabilities

7 Kilohertz (khz) Codec

- Speech encoding and decoding at 7 khz, compatible with codec at the far end. Coding standards are G.722.
- Interface compatible with TA (e.g., V.35 at 56/64 kbps).
- Interfaces to required peripherals - tape decks and microphones.

Terminal Adapter

- Interface compatible with codec.
- Voice calling for coordination with far end.
- B channel capabilities:
  - Simultaneous voice and circuit-data calling.
  - If using NI-1, support for two Directory Numbers (DNs) and Service Profile IDs (SPIDs) will be needed.
- Physical interfaces:
  - Analog phone jack.
  - Interface to codec (e.g., RS-449, or V.35).
  - RJ-45 connector to NT-1, or integrated NT-1.

Request These Capabilities From ISDN Service Provider

Network Interface to Terminal Adapter

Network Services Required:

- One BRI. (2B)
- One B channel for voice calls, with voice DN and SPID.
- One B channel for circuit-data calls, with circuit-data DN and SPID.
- Voice Features:
  - None required.
- Circuit-Data Features:
  - None required.

Subscription or Ordering Information:

- This interface is configured for simultaneous voice and circuit-data calls (NIIG 11). Other NIIGs which have this functionality include 12, 15, 17, 21, 22, 25, and 27.
- Parameter Groups for Voice Features:
  - None required.
- Parameter Groups for Circuit-Data Features:
  - None required.

Technical Notes

- 2B+D interfaces and simultaneous voice and circuit data calling lets operators at each end talk to each other while setting up the 7 khz audio call. The solution will work with circuit-data calling only (1B). -
- In this solution, the 7 khz audio signal (from the codec) is conveyed over circuit-data. Alternatively, the audio signal can be carried on the 3.1 khz bearer capability.
- TAs can interwork with CSU/DSUs on Switched 56 networks.
- For details on subscription and ordering information using NIUF ISDN Interface Groups (NIIGs) and NIUF ISDN Parameter Groups (NIPG), see Section 5.1.11.
- For detailed Signaling Flow Diagrams for this application, see Sections 5.2.1.5 (Circuit-Data Call Setup) and 5.2.1.6 (Voice & Circuit-Data Call Clearing).