

# Adventures in Broadband: ISDN

by Jeffrey Race

## *What is ISDN*

For communications-intensive individuals or businesses, TOT and TelecomAsia are now promoting an old but highly cost-effective system, the Integrated Services Digital Network.

It sounds daunting, but a bit of self-education can bring you greatly enhanced communications at nominal cost. The hurdle is getting an overview of a technically complicated service, understanding how to make it work for you, how to install the hardware, and how to set it up.

This article aims to tell the reader how he can benefit from ISDN and what time and financial budgets he needs to accomplish his aims.

Who doesn't need ISDN? Anyone who needs only a single phone line, who doesn't go on the internet, or who uses the internet but values his time at less 15 baht per hour (the difference between analogue and ISDN internet access rates) and doesn't care if his callers get a busy signal.

Who needs ISDN? Anyone who needs a phone line and would like to be able to use a another phone, or fax, or the internet simultaneously. Or anyone who goes on the Net and values his time over 15 baht per hour.

It is also an excellent alternative to leased lines for businesses with a branch network and/or which use the internet extensively, or which wish to support telecommuting. (Numerous commercial packages exist to allow full office computer network and telephone system functionality to appear at a remote location via ISDN.)

What does a successful ISDN installation require? After reading this article, you may need an hour to arrange installation of the phone line (the service providers will fax you the form), and perhaps a day to contact equipment vendors to get competitive quotes for the best hardware for your installation.

The hardware can cost from 2,000 baht to 15,000 baht depending on your needs, but some ISPs offer it at reduced price with an ISDN-enabled subscription and throw in installation as well.

Then you will have to wait several weeks for the line, which costs the same as a regular phone line. (Some optional ISDN features cost extra.) Setup of your hardware and configuration of your computer may take half an hour. That's it!

What does an individual user get? With Basic Rate Interface (BRI, also called Basic Access Interface, abbreviated BAI) silent Internet logon in four seconds (instead of 30-45 seconds of modem screeching), and web downloads at two to four times the maximum speed one can expect from an analogue dialup line.

When TOT resolves an internal dispute, one will also be able obtain multiple phone numbers for a reduced price. Companies can choose the more expensive Primary Rate Interface (PRI) and achieve 30 times this for their branch networks or telecommuters.

You cannot convert an existing phone number to ISDN, so if you want ISDN you must obtain a new directory number.

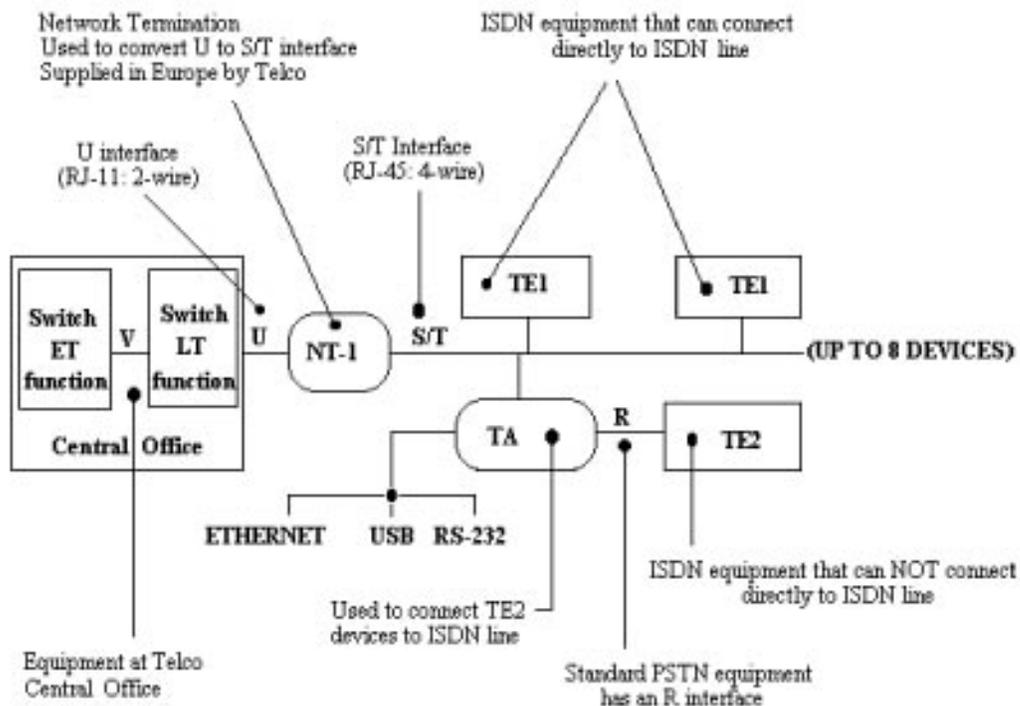
Broadband alternatives for internet access are ADSL and cable modem. However these are only just now undergoing trials while ISDN is widely available in Bangkok. Also, ISDN is a mature and tested technology inexpensively offering multiple services. ADSL and cable modem access offer a different bundle of features and remain to be proven in the field. They will be covered in future articles. If you need cost-effective, fast internet access and multiple phone lines now, ISDN is for you.

### The Structure of ISDN

Traditional telephone service links each customer with the Central Office using a single pair of wires carrying electrical currents which vary in frequency and amplitude according to the speaker's voice.

This technology goes back more than a century and was adapted with difficulty to modern computer communications which signal with ones and zeroes ("digital") rather than continuously varying voltages ("analogue"). (Computers are really stupid; they can count only to one.) The intermediary is the modem (MODulator-DEMulator) which is what modern man hears screeching everywhere nowadays.

## ISDN SYSTEM ARCHITECTURE



The BAI "U" interface carries two 64 kbps B ("bearer") channels and one 16 kbps D ("data") channel for control, signalling, and low-speed data communication. The PRI "U" interface carries 30 B channels and one D channel.

In fact the connections between Central Offices are now all digital, allowing much more efficient use of equipment and transmission paths. The insight behind ISDN was to extend this all the way to the customer. As a result the same single pair of wires enabled for BAI can now carry two phone numbers (on two "B" or "bearer" channels) instead of one.

And one or both of these channels can be used for computer-to-computer communication (for example internet web browsing, corporate network communications, or videoconferencing), at speeds up to 128 kbps.

This is nominally 2-1/2 times faster than the fastest analogue dialup speed but in reality it is even faster because there are fewer errors on the now completely digital path. A PRI installation enables 30 B channels, typically for business use.

Accomplishing this miracle of modern technology requires special equipment at the customer's premise, and understanding what is needed requires a picture.

The ISDN standard developed in 1984 defines 4 "interfaces" which appear physically as jacks or "ports" on ISDN equipment:

**U** This is the delivery-point of the phone company's copper wire pair. In Europe it is connected to a Network Termination 1 (NT-1), owned only by the phone monopoly and rented to the customer, who never sees it. In Thailand both TOT and TelecomAsia offer the U interface so the customer may rent the NT-1 (100 baht per month), buy it (5,000 baht), or buy a Terminal Adapter (see below) which includes the NT-1. (Many brands now do.)

**S/T** The NT-1 presents two 8-pin RJ-45 phone jacks (physically identical to the connectors and cabling used for 10BaseT Ethernet, larger than the 6-pin jack we normally use for an analogue phone line), which are the S or T interface (technically different but in practice the same for us). Here one may plug in a special ISDN feature phone offering numerous capabilities not readily available in standard analogue telephone instruments, such as call forwarding, call barring by number, call conferencing, multiple phone number identities, and multiple user profiles. These phone sets are rather costly (5,000 to 10,000 baht) but for business or professional use they pay their way. Up to eight devices may be connected to the S/T bus simultaneously using T jacks. The NT-1 arbitrates among them allowing only two devices to access the two B channels simultaneously. Devices connected directly to the S/T bus are called TE1.

Two telsets can be plugged in, and in the event of a power failure, one set will still work, as the European standard which Thailand adopted requires emergency power to be supplied to one telset from the Central Office. The NT-1 itself requires local commercial power and so its other functions will not be available. Pins 1-2 and 7-8 of the RJ-45 connector may be wired to provide emergency power.

If one wanted only phone service one could stop here. Two telsets can be plugged in and both can be used simultaneously, appearing as either the same or different directory numbers to a called party depending upon programming.

However the fun just starts now. One can also buy a Terminal Adapter, a modem-like device connecting a computer's serial or USB port to the digital phone line. To the computer it looks like a modem, and it allows high-speed digital access to the internet or (by dialing another ISDN number) to another computer, for example for high-speed file transfer or videoconferencing between company branches.

**R** Many Terminal Adapters also offer two R ports, which are ordinary 6-contact RJ-11 jacks into which the user may plug a plain analogue telephone, a fax machine, or even an analogue modem. The jacks appear like two ordinary phone lines and in fact both can be used simultaneously just like the digital phones.

According to the international standard, up to eight directory numbers can be mapped to one ISDN copper pair, any two of which (as digital phones, analog phones, or 64 kbps digital data channels) may be active simultaneously. A subsequent incoming call, if both B channels are in use, will receive a busy signal, with one very important exception.

Many Terminal Adapters offer Bandwidth On Demand (BOD/BACP) allowing them to be programmed to operate optionally at 128 kbps but automatically fall back to 64 kbps if a phone call comes in. This is one of ISDN's unusual features which makes it so useful in commercial use.

A device incapable of connecting to the S/T bus is called a TE2 device and requires a Terminal Adapter to convert the signalling.

Terminal Adapters also exist in specialized form combining for example an Ethernet-compatible multi-port router, or one or more analogue modems.

### *Installing an ISDN Telephone Line*

ISDN service is available at any location in Bangkok or the provinces within a distance of 5.5 km of an ISDN-enabled Central Office; check with your local service provider. In many locations both TOT and TelecomAsia will offer service; pricing and technical features are identical; in some places only one or the other will be physically able to offer coverage. Regardless of which provider you choose, be sure to obtain from the TOT Marketing Department their current list of hardware providers.

ISDN SERVICE PROVIDERS			
Provider	Sign-up Number	Tech Query Number	Remark
Telephone Organization of Thailand <www.tot.or.th>	Local area commercial service center (consult phone directory)	574-8610	Offers both BAI and PRI Marketing Department at 574-8617 can fax on request a useful overview (in Thai) with listing of hardware vendors
TelecomAsia <www.telecomasia.co.th>	900-9091	900-9091	Presently promotes only PRI to commercial customers

A TT&T representative advises that her firm will instead offer ADSL for the broadband needs of its customers outside Bangkok.

Several important points deserve consideration.

One, since the ISDN equipment will belong to you and you bear the risk of economic loss if it is damaged by lightning or power surges on the telephone line, ensure that your service provider installs a lightning protector with a proper ground. This means the structural metal framework of an office building, the metal (not plastic!) water pipe of a residence, or a driven copper ground rod with an effective resistance of under 25 ohms (ideally under 5 ohms).

If your installation is in a suburban or provincial area, then consider to install a better protector than offered by either TOT or TelecomAsia; otherwise your expensive ISDN hardware may fry in the first electrical storm. Such a device (called the Multi-Protector) is actually manufactured in Thailand for export and may be obtained from Goham (Thailand) Co. Ltd. Refer to the hardware vendors section below.

Second, if your Terminal Adapter includes a frame ground connection, be certain to connect it to the *same* ground as is used by the lightning protector or Multi-Protector. This will protect the Terminal Adapter from incoming overvoltages and ensure no "ground potential difference" arises which can occur if the Terminal Adapter and lightning protector use separate grounds. And ensure that your computer's third (ground) power pin goes to the same ground. (The one the installer broke off, remember?)

Third, if you will be using your ISDN service for mission-critical work, develop a backup power plan. If you need only phone service, you may use a special ISDN telephone instrument which will be powered from the ISDN line in case of commercial power failure. Such instruments, available from several local ISDN hardware vendors, offer numerous whiz-bang convenience features but are expensive at 5,000 to 10,000 baht per device.

An alternative is to use analogue telsets from a Terminal Adapter's R port, but maintaining telephone service through a commercial power failure requires installing an Uninterruptible Power Supply in front of the Terminal Adapter, unless it contains an internal backup battery. Only one unit presently sold in Bangkok has this internal backup battery feature.

Fourth, decide whether you need to rent (or buy) an NT-1. This expense can be avoided by using a Terminal Adapter with an embedded NT-1; some have and some don't.

Fifth, be alerted that you cannot report an ISDN circuit failure to TOT using the standard 1177 call procedure, since the interactive voice response system has not yet been programmed to accept ISDN numbers. You must select the "speak to a service representative" option, input a phony number, inform the service representative you fooled his robot to access a human, and then give him the actual ISDN number. (TelecomAsia's reporting mechanism already works right on the first try.)

The flip side is that every NT-1 has an inbuilt responder allowing the Central Office instantly to check the line (one of the many clever customer-friendly design features of ISDN). Several similar technologies are inexpensively available for immediate verification of standard analogue phone lines and have been offered many times by many vendors to both TOT and TelecomAsia. However both have declined to take up these technologies on the ground that they benefit the customer more than the provider so the expense is not justified.

Three important ISDN supplementary services are technically possible here because the equipment and software packages were purchased, but they are not presently enabled.

The first is Multiple Subscriber Numbering (MSN), an unusual and very useful capability which allows mapping up to eight separate telephone numbers to an ISDN PRI (BAI) installation. In this way eight different TE1 or TE2 devices can each have a unique directory number, for example, plain or digital telephone instruments or DUN ports on a networked computer server. Each device will answer only its own incoming call. Only two devices can be online simultaneously (since there are only two B channels) but a small office could have for example one fax machine, one DUN computer server port, and six telephone sets serving six different persons, each with a unique telephone number.

Unfortunately TOT's technical and legal staffs have been quarreling for years about how to price this service (at press time still without a date for resolution), so this advanced and very useful technical capability remains unavailable.

A second useful but unexploited ISDN capability is called AO/DI (for Always On/Dynamic ISDN). Currently a customer (for example a company using ISDN for communication between branches or with a third party) must call the desired ISDN number and hold up the circuit as long as data might be transmitted even though the bursty nature of data transmissions means the circuit is mostly idle. AO/DI allows the so-called Data or "D" channel (16 kbps, always on for control and signalling purposes) to wake up a B channel upon demand. TOT has not allowed customers to use this capability.

Third, the D-channel can be used for low-speed signalling (e.g. e-mail or Point of Sale cardreader query) via the X.25 protocol, and this is one of the most popular commercial applications for ISDN abroad. Again, the Thai ISDN network is technically capable of supporting this useful application but TOT neither offers it nor allows TelecomAsia to do so.

In short, Thailand's ISDN hardware is as technically advanced as any in the world but legal and management obstacles as usual prevent the nation from reaching its potential.

## *HARDWARE*

If you want to use ISDN for data transmission such as corporate branch data transfers or internet access, you will need a Terminal Adapter to convert the ISDN synchronous datastream to the asynchronous protocol desktop computers employ.

The accompanying table presents representative Terminal Adapters now available (not including routers and bridges, which are used principally in corporate networks) in Bangkok. Many more devices are available, and new ones are coming all the time, so check around for current offerings and prices. The TOT Marketing Department provides a lengthy list of hardware vendors.

The point of the hardware table is to illustrate the important choices the buyer faces in fulfilling his technical requirement and to give a ballpark idea of pricing by feature set.

The main choices to consider follow.

***NT-1 or not*** You may buy or rent an NT-1 and connect a digital telephone directly to it.

However if you want to transmit data, you may buy a Terminal Adapter which includes the NT-1, or buy one without and rent/buy the NT-1 from your ISDN provider.

**Computer interface** The big choices here are internal PCI card (least expensive, high speed but limited capability, no R port), external USB (small, inexpensive, needs no commercial power), external serial (consider whether your software platform is supported) or Ethernet (fast, more expensive, available in ISDN routers and bridges, currently Bht 15,000 and up and not shown in the hardware table).

If speed is important to you, devote special consideration to the interface issue. Internal cards access system memory directly over the bus and so can operate at the full 128 kbps, as can USB devices. External Terminal Adapters operating over a serial port are limited by the port's speed of 115.2 kbps.

However the external adapter must convert data from synchronous to asynchronous mode to communicate with the serial port, forcing it to insert start and stop bits and dropping the top rate down to 94 kbps. This will not matter unless you bond two channels and want to link at 128 kbps.

One workaround is a special coprocessed serial port (about US\$125.00); another is an ISDN router which provides access to the full ISDN bandwidth over the computer's Ethernet interface.

**Ease of installation** Most of the hardware comes with idiot-proof install routines but since they are making better idiots every day, check carefully whether your hardware and software are supported and even get an assurance from your hardware vendor to install for you. For Windows most installs proceed uneventfully using PnP (Plug and Pray).

**Software-supported features** ISDN includes many capabilities; ensure those you need are supported, especially (if you need it) BOD/BACP which allows you to seize both B channels to achieve up to a 128 kbps transfer rate, for example if you expect to make lengthy file transfers. (One would select the Multilink PPP connection instead of the PPP connection in Windows.)

**Bundled software** Some hardware comes with useful utilities to support telephone, fax, answering machine, videophone and other tasks.

However this software is generally crippled to work only with the bundled hardware; it must be upgraded at a fee to operate with other vendors' hardware or to achieve the most extensive feature set. (For example RVS-COM must be upgraded to the Standard version to support videophone via USB.)

Don't expect a lot from bundled voice or video software, which is available only for Windows. When using internal speaker and microphone at any reasonable volume level, calls suffer intolerable echo or oscillations. This is not the fault of ISDN but results from audible feedback at the audio-equipped computer, which is not adequately handled (or handled at all) by local DSP echo cancellation. Using headphones or a handset solves this problem, which then is replaced by the next: excessive line delay. (Remember when you listened to Mission Control talking to the astronauts on the moon?)

**R interface** If you want to connect standard analogue telephone devices (phones, fax or answering machines, analogue modems) to your ISDN line, you must select hardware with an R interface, often labelled "Telset" or "POTS".

In fact an analogue modem dialing out over an R interface should achieve better throughput than when dialing over an ordinary telephone line, and this is true for a number of the hardware devices shown in the table.

However several vendors' products work fine with a 28.8 kbps analogue modem but fail to dial or to connect when driven by a 56 kbps analogue modem. So be sure to test your actual device before paying, if this function is important to you.

**Backup power** If continuity of service is important, support your NT-1, Terminal Adapter, and perhaps computer, with an Uninterruptible Power Supply (UPS), or select a Terminal Adapter with included battery backup.

**Status display** Models vary widely here, from none, to LEDs, to LCD. Also some models provide incoming Caller ID in an LCD, and some even pass it through to a Caller-ID-equipped analogue telephone instrument. Read the fine print of the specification if this is important to you.

REPRESENTATIVE ISDN HARDWARE AVAILABLE IN BANGKOK MID-2001

Key: U Contains NT-1  
 CI Computer Interface  
 S/T Number of S/T ports  
 R Number of R (analogue/POTS) ports)

	U	CI	S/T	R	Remark
IS128-PCI (Taicom)	-	Internal	1	-	Use only for internet since no NT-1 and only one S/T port. About Bht 2,000. Least expensive solution.
Webjet Pocket (Allied Data)	-	USB	1	-	Use only for internet since no NT-1 and only one S/T port. Bundled with BVRP fax/answering machine software. Apple driver. About Bht 4,000.
Webjet 128 (Allied Data)	-	RS-232	1	-	Use only for internet since no NT and only one S/T interface. Includes RVS-COM Lite file transfer, fax and speakerphone software. Apple driver. About 3,500 baht.
Omni.net USB (Zyxel)	-	USB	1	-	Bundled with RVS-Com Lite software. Apple driver. About Bht 4,300
Omni.net LCD+M (Zyxel)	-	RS-232	1	2	Displays incoming call number in LCD; excellent graphical configuration utility. Bundled with RVS-COM Lite software. Includes analogue modem. About Bht 17,500.
Omni.net LCD (Zyxel)		RS232	1	2	Displays incoming call number in LCD; excellent graphical configuration utility. Bundled with RVS-COM Lite software. About Bht 10,600.
UTA2500 (Formosa Industrial)	Y	RS232	1	2	Use for both internet and POTS; allows intercom and call transfer. About Bht 11,000.
IS128SU-LCD (Taicom)	Y	RS232	2	2	Use for both internet and POTS; allows intercom and call transfer. Has illuminated LCD showing status and incoming caller ID. Only unit with internal battery backup. Apple driver. About Bht 13,000.

Representative ISDN Hardware Vendors in Bangkok

Allied Data Telephone 038 963-523 Telefax 038 963-526 <<http://www.allieddata.com>>  
Only local manufacturer of ISDN Terminal Adapters

Goham (Thailand) Co. Ltd Telephone 02 279-6162 Telefax 02 271-4956  
Locally manufactures Multi-Protector suited for locations subject to electrical storms;  
download installation instructions at <[www.camblab.com/consumer/opmp\\_ug1.pdf](http://www.camblab.com/consumer/opmp_ug1.pdf)>

Astra Electology Telephone 01 921-8129 Telefax 02 921-8134 <<http://www.aspera.co.th>>  
Hardware vendor with emphasis on networking

Proimage Engineering Telephone/Telefax 02 634-3323 <<http://www.3dsiam.com>>  
Hardware vendor with emphasis on networking

Stable Communication Telephone 02 585-6975 Telefax 02 585-6976  
Hardware vendor supporting videoconferencing

Tele-Dynamic Co. Ltd Telephone 02 271-0235 Telefax 02 271-4800  
Hardware vendor supporting videoconferencing

Readers are encouraged to consult the vendor list supplied by TOT Marketing Department  
which contains names of many excellent vendors whose equipment could not be reviewed here.

## OPERATING SYSTEM SUPPORT

**Windows9x/NT** This is the principal target market for vendors so all hardware now supports this platform, usually via PnP with an INF file and drivers provided on floppies or CD.

Several of the hardware devices profiled in the table include useful utilities to test the ISDN line or display onscreen the connection and throughput status as well. The PnP routine will install one or more special ISDN COM ports; these are then associated in Dial Up Networking (DUN) with icons to dial the selected ISP. For this one needs only the username, password, dialin number and DNS IP addresses (primary and backup).

**Windows 3.1** ISDN works fine with Windows 3.1, the most popular GUI at ISDN's birth. Recent hardware does not gracefully install, but ingenuity solves this problem for the determined using an internal ISDN card or external device connected via serial port. Windows 3.1 does not support USB.

For an internal PC card running directly off the bus, Microsoft provides detailed instructions for installing TCP/IP ("Enabling the Microsoft TCP/IP Protocol with WFWG 3.1"); see Resources below. The actual TCP/IP code is contained in file TCP32b.EXE and is a 674 kb download from the Microsoft site. Windows for Workgroups contains the RAS dialer which is then configured to use an ISDN COM port similarly to the case for Win9x. See "How to Install ISDN on WFWG 3.11 RAS".

The procedure differs for an external Terminal Adapter, which looks just like any modem employing the Hayes command set. Windows itself cannot address such a device due to its 57 kbps maximum throughput speed. However the shareware Trumpet Winsock provides a dialer which can be configured to dial with AT commands and authenticate using PAP just like the Win9x DUN utility. Obtain per details in the Resources box.

To configure Trumpet Winsock first determine the proper initialization string for your external Terminal Adapter; this will appear in its INF file; or look at the string in a successful DUN install. For example a default Trumpet Winsock initialization string might be &F&C1&K3, while one of the Terminal Adapter's strings (for a 64 kbps PPP link) is E0Q0V1X1&C1%A2=5. Then:

- 1-Install Trumpet Winsock and click its icon to run.
- 2-In the Trumpet Winsock window, choose File/Setup.
- 3-Enter the following settings :

IP Address : 0.0.0.0  
Name Server : [DNS IP addresses provided by your ISP]  
Domain Suffix : [ISP's domain name]  
MTU : 576  
TCP RWIN : 2048  
TCP MSS : 512

- 4-Click OK
- 5-Choose File/PPP Option; the PAP Authentication Option dialog is now displayed. Enter your username in the "User name" field and your password in the Password field; then click OK to close.

Having set up Trumpet Winsock, to dial to your ISP open Trumpet Winsock and choose Manual Login from the Dialer menu. Then type the command "atdt" followed by the dialin phone number of your ISP and key Enter. After receiving the screen message CONNECT key Escape. You are now logged in and can open a browser or mail client.

In the setup don't use VJ compression, which is only for SLIP; just use PAP, not CHAP. (PAP eliminates need for login script as it incorporates password protection transparently.) Set DCD on and ensure &C1 is in the initialization string (default). Ensure there is only one WINSOCK.DLL on the partition and that it is in the path.

Don't forget, if you are going to use a browser like Internet Explorer, to input under Connection Properties/TCPIP settings the DNS IP address provided by your ISP. Otherwise you will get error messages when attempting to access any website.

**OS/2** provides integrated support for serial hardware, so no special drivers are needed for Terminal Adapters connected to a serial port. For a dialer use shareware InJoy. Setup of this dialer is very simple; just input username, password, dialin number and the ISP's DNS IP addresses. Click Dial and in four seconds you are on line. InJoy provides very useful statistics while online (and a bar graph displaying instantaneous usage of maximum channel capacity), and a detailed log at the conclusion of the session.

For an internal card using a CAPI driver use isdnPM as a dialer.

You may want to replace IBM's comm drivers with a shareware driver package called SIO from Ray Gwinn; see the accompanying Resource box. SIO includes a small but clever component called VMODEM which lets you define a virtual serial port that ordinary terminal software can use to virtually dial into a remote host; VMODEM converts the ATDT dial string into a telnet connection and spoofs the terminal software with a dummy CONNECT message.

SIO also includes PMLM ("Poor Man's Line Monitor") which can create a complete character-by-character log of the session, just as a protocol analyzer would do.

Note that you cannot use an ordinary terminal program like Procomm or Hyperterminal to log on since you must execute a PAP protocol exchange.

For both dialers you must also input the proper Terminal Adapter initialization string, which sets the type of ISDN call desired (e.g. PPP 64 kbps, Multilink PPP 128 kbps, HDLC). Obtain this initialization string from the manufacturer's user manual, or manually from the provided INF file. For example the UTA2500 WIN95.INF file shows:

HKR, Init, 2,, "AT%A2=1<cr>"	[this sets to 64 kbps session protocol]
HKR, Init, 3,, "AT&C1&D2E0V1X0<cr>"	[this sets other modem characteristics]

If one has a working Win9x setup, one can use View Log in RAS to extract the initialization string, or use Regedit to view as it is kept in the Registry.

**Apple** Several hardware devices support the MacOS at various levels.

**Linux** Almost every distribution contains "ISDN HowTo" which includes everything you need to know for a manual install. RedHat 7.0 and SuSE now include Point and Click installation routines which some report to be even easier than on Windows. See the Resource box for an online FAQ.

### *ISPs Supporting ISDN Connectivity*

A principal goal of most ISDN installations is internet access. Not all Bangkok ISPs support ISDN connectivity, and those that do require opening a separate account for ISDN access (unlike practice in other countries whose ISPs offer both analogue and digital access via the same account profile).

ISDN accounts currently run about 20-35 baht per hour for a single 64 kpbs channel, and twice this if access is via Multilink PPP. But for applications where time is money, the increment over the analog access price is cost-effective.

A survey of local ISPs shows that they differ substantially in their marketing emphasis, types of service, and user-friendliness. Loxinfo and A-Net provided the best setup packages while at least three of the ISDN-enabled ISPs have their SMTP servers internationally blacklisted for harbouring spammers. (Researching this article showed why: a few days after KSC kindly agreed to set up a test account, spam started coming from CS Internet.)

Also, a warning: if you already have an e-mail account, and successfully set up an ISDN e-mail account, you will discover that you cannot send out mail! You must obtain from your ISDN-enabled ISP the domain name or IP address of its SMTP server and input it to the SMTP Server configuration menu of your mail client. You may have to change this on the fly if you access different ISPs or ISP accounts from the same mail client. Or if your mail client allows, configure separate profiles or accounts for the two or more SMTP gateways you access.

The accompanying table lists Bangkok-based ISPs currently promoting ISDN access.

Each intending user should evaluate ISPs according to his own requirements. Important differences are hourly cost of access, availability of 24/7 technical support and knowledgeability of support personnel, reliability of access and of international links, and support of a news server.

Since ISP performance by each criterion may vary from time to time and with management changes, intending users may have to experiment to find their dream ISDN-enabled ISP.

ISPs Offering ISDN Connectivity in Bangkok

A-NET Telephone 02 861-1555 Telefax 02 861-1544 info@a-net.net.th  
Not the same as Asia Infonet! Offers both individual and corporate accounts

Asia Infonet Telephone 02 641-1800 Telefax 02 641-1808 service@asianet.co.th  
Part of TelecomAsia group, focussing mainly on PRI to businesses; no news server

INET Telephone 02 642-7065 Telefax 02 640-0456 account@inet.co.th  
Currently offers only corporate accounts but may open individual accounts in due course

Jasmine Internet Telephone 02 502-3700 Telefax 02 502-3737 cs@ji-net.com  
Support only business customers with flat-rate charge of Bht 17,000 monthly

KSC Telephone 02 979-7305 Telefax 02 979-7349 bd@ksc.net.th  
Offers both individual and corporate accounts

Loxinfo Telephone 02 622-5588 Telefax 02 622-5666 info@loxinfo.co.th  
Offers both individual and corporate accounts

Pacific Internet Telephone 02 618-8888 Telefax 02 618-8195 sales@pacific.net.th  
Offers both individual and corporate accounts

Reach Telephone 02 637-3000 Telefax 02 639-5383 contact@reach.net.th  
Corporate end-to-end services utilizing Reach-managed IP network

Roynet Telephone 02 652-8600 Telefax 02 652-8605 info@mbox.roynet.co.th  
Offers both individual and corporate accounts; no news server

Samart Telephone 02 502-6844 Telefax 02 502-6883 infonet@samarts.com

## Useful Resources

### Information on Windows installations:

Microsoft Telephone 02 266-3300 Telefax 02 266-3310 tech\_mst@microsoft.com

"Enabling the Microsoft TCP/IP Protocol with WFWG 3.1"

<<http://support.microsoft.com/support/kb/articles/q93/7/36.asp>>

"How to Install ISDN on WFWG 3.11 RAS"

<<http://support.microsoft.com/support/kb/articles/q118/6/65.asp>>

Trumpet Winsock for dialing from Windows 3.1 serial port

<<http://www.trumpet.com.au/>>

### Linux FAQ

<<http://www.isdn4linux.de/faq/>>

### OS/2 resources

InJoy download

<<http://www.fx.dk>>

isdnPM download

<[www.mensys.nl](http://www.mensys.nl)>

SIO comm drivers and utilities

<<http://www.gwinn.com>>

cFos multi-platform/multi-purpose drivers and utilities

<[www.cfos.de](http://www.cfos.de)>

### Information on technical aspects of ISDN

<<http://www.asahi-net.or.jp/~PF2K-WLKN/inetjfaq.html>>

Benefits of ISDN compared to POTS and to cable and DSL; overview of hardware, software; focussed on Japan but much useful general information

<<http://www.alumni.caltech.edu/~dank/isdn/>> Links (some outdated) to

the world's principal English-language ISDN-related websites

<<http://www.isdnzone.com/>> A hardware vendor's informative site

<<http://www.isdnzone.com/info/dynisdn/htm>> The Always On/Dynamic ISDN standard

<[nnntp://comp.dcom.isdn](mailto:comp.dcom.isdn)> The official ISDN newsgroup

<<http://www.accsystems.com/isdnprim.htm>> provides excellent ISDN technical tutorial

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