

BY REX WIDMER

# Remote Access for a P/390 OS/390 System: Part II – Implementation and Deployment of the Solution

Several methods were evaluated for remote access to the MVS P/390 system, with the primary solution chosen being Internet and TN3270. Multiple remote TN3270 client platforms were qualified over a variety of hardware and software platforms, and OS/2-based remote control was also implemented for some special uses.

**PART I** of this series (*Technical Support*, December 1997) described five remote connectivity options for MVS running on a P/390 platform. The goal was to find a cost-effective method to provide both local and wide area remote access to 3270 TSO sessions running on the P/390. While these five approaches are not the entire universe, they were the ones that were apparent at the time, fit the MVS and OS/2 environments, and appeared to be viable in meeting the goal. Options explored included: IBM 3174 controller with the AEA feature; a JDS Microprocessing Hydra 3000 protocol converter; hardware-based LAN remote access using the IBM 8235 DIALS; OS/2 remote control software; and a TN3270/TCP/IP remote access approach.

Based on the number of users that could be accommodated across a single dial-up link, initial costs, and operating costs, the TN3270/TCP/IP solution (Figure 1) was chosen as the primary method. Hardware costs were limited to a modem; software costs were minimal; multiple users could be active concurrently over a single communication line; and long-haul remote user communication costs were essentially free due to the “tunneling through the Internet” approach. Figure 3 illustrates the end-to-end components involved in the TN3270 solution. A key factor to the approach that I used is that *no changes* were required to the MVS environment. Additionally, *no TCP/IP* was required on MVS. All of the connectivity implementation was done on the OS/2 side of the Server 500 P/390 system.

OS/2 remote control (Figure 2) was implemented as a secondary approach to provide the ability to access the MVS console, and control the P/390 “front panel” remotely.

While this solution provided only a single concurrent user, and used regular long distance telephone facilities, it was selected in order to provide the rarely used but essential functions such as IPLing the MVS system. Figure 4 illustrates the end-to-end components involved in the OS/2 remote control approach. Again, no changes to MVS. The only change was to implement the remote control application on the OS/2 side of the Server 500 P/390 system.

## TN3270 IMPLEMENTATION AND DEPLOYMENT

Initial deployment of the Internet/TN3270 solution first required implementing several components on both the Server 500 platform and the client platforms. While none of these implementations was difficult, the hoops I had to jump through added to the adventure. Perhaps the biggest difficulty was “too many unknowns.” To deal with these unknowns, basic Internet connectivity was established on both the server and the client machines. Then, the TN3270 server and clients were brought up. **TIP:** If you have the IP address of a TN3270 server, you can reduce the unknowns by trying to connect to the server with your clients even if you do not have access to the system. Successfully receiving the VTAM logo screen from a known TN3270 server confirms that your client package is functioning.

## INITIAL SERVER ACTIVITIES

On the Server 500 OS/2 side, TCP/IP had to be implemented. Although the TCP/IP furnished with the Internet Access Kit (IAK) of OS/2 Warp may have sufficed, there were concerns about using this TCP/IP. The dial-out component of the IAK was believed not to support the needed

Point-to-Point Protocol (PPP) required for the remote access project. Based on this, several components of OS/2 were upgraded to their equivalents from OS/2 Warp Connect. The documented procedures were used to create the 3.5" disk install packages for MTPS and TCP/IP from a Warp Connect CD **Note:** This would not have been required if the Warp Connect or Warp Server version of OS/2 was already installed on the Server 500. The MTPS component was then installed and configured to add support for TCP/IP, thus replacing the LAPS component originally installed as part of the P/390 support. The installation of the TCP/IP and other components from the Warp Connect CD also provided the "Dial Other Internet Providers" component and other useful features such as a browser and an FTP component.

The next task was to get OS/2 talking to the Internet. The first part of this step did not provide connection between the MVS side of the system and the Internet, just between OS/2 and the Internet. One step at a time, slow and easy, make sure it all works ...

Both analog and ISDN dial-up connectivity were investigated. While ISDN was available and could provide higher speeds, it was too costly. In the Kansas City area, ISDN access lines cost more than \$100 per month. These same costs were borne by the service providers, so their charges were high. Thus, analog connection with low cost phone lines and low service provider costs was selected.

A modem was acquired for the system. I purchased both a US Robotics Courier and a US Robotics Sportster, both 33.6KB external models. While the Courier cost almost twice as much as the Sportster, it didn't provide any noticeable benefits for the PPP connection. However, it did provide useful security features for dial-in mode, which is not used by the PPP connection, but is used by the remote control approach. Auto re-dial was available in the Courier, but was incompatible with the PPP and modem pool technology used by the ISPs. Currently, the Courier is deployed as the PPP outgoing modem, and the Sportster is used either on a client test machine or for the OS/2 remote control application.

I contacted several ISPs regarding the availability of a fixed IP address, which was a key concern of mine. With a fixed IP address, the user always appears at the same address in the Internet addressing scheme. It

doesn't matter if the user connects with modem 1 or modem 600 at the ISP, the ISP always translates the traffic from the system so that it appears to originate from the same IP address. This feature allows the clients a fixed IP address target for every connection. About 25 percent of the local ISPs were able to provide a dial-up connection with PPP capability and a fixed IP address. ISP rates ran approximately \$20 plus a \$2 to \$5 surcharge for fixed IP addresses for unlimited access.

---

**Several methods were  
evaluated for remote access  
to the MVS P/390 system.  
The primary solution of Internet  
and TN3270 was chosen.**

---

Subscriptions for unlimited access, fixed IP address and PPP capabilities were obtained from two local providers. At this point the goose chase began. Technical support from the ISPs was lacking. One ISP was brought up fairly quickly, the other took about a week of frustration before the basic PPP connectivity could be established between the OS/2 system and the Internet. At this point, I could use PING and FTP, and browse the Internet from OS/2 running on the Server 500. Use of the browser is not recommended while running MVS, since browsers tend to be both memory and CPU cycle hogs. However, occasionally, the browser and FTP are handy to use to pick up items from the P/390 FTP site and send them directly to the machine where they are needed. I have since installed Netscape for OS/2 2.02, which is an even bigger consumer of resources, but tends to work better than the mail, FTP and browser components supplied with Warp Connect.

Extra memory on the OS/2 side will help if you are going to deploy this solution. The system will probably run in the standard 32MB configuration (on the Pentium side), but the additional memory will eliminate any OS/2 paging. Prior to implementing the remote access project, I increased the OS/2 side memory on my system to 128MB. With only 32MB of OS/2

memory present, paging-related performance on the OS/2 side of the system is a real concern. If the OS/2 system is tied up paging, it cannot service the P/390's service requests. As usual, a few fixes were recommended. A "get software updates" icon appeared on the newly installed TCP/IP support, allowing me to download and replace nearly all of the installed TCP/IP software from an IBM FTP site. Reconfiguration was not required after the download, only the usual OS/2 reboot (now you see why I left the P/390 MVS side down during this phase of the project). At this point, the initial OS/2 side of the Server 500 deployment was complete. A PPP connection could successfully be established with either ISP and the Internet.

#### SUBSEQUENT SERVER ACTIVITIES

Once the basic PPP connection to an ISP had been successfully established, the next step was to establish the TN3270 server. This involved the use of the Configure P/390 application. Suitable 3270 device addresses had to be set to active and the LAN3174 driver enabled for these addresses. Suitable device addresses were found in the 903 range. These addresses were already included in the HCD definition distributed with the system. This can be confirmed by issuing the following MVS command:

```
D U,,,900,16
```

This will show a series of 3270 devices defined at this range. Unused devices will likely appear as "OFFLINE." Devices 901 and 902 may already be in use as local 3270s defined to the Server 500, so start with the first device shown as inactive by the Configure P/390 application. While the help available for the LAN3274 driver describes the use of TCP/IP and TN3270 to provide 3270 connectivity to the P/390, it doesn't include information on dial-in and the use of the Internet as a WAN for this connectivity. Of course, if everything were there, I would not have had all of the fun getting this to work, and would not have written this article! A final step in the server preparation is to update the IPL.CMD to include a non-zero TCP/IP port number on the CALL DMSTART "aws3274.exe n /PORT" statement or to enter a port number through Configure P/390. (The latter method became effective with newer P/390

Figure 1: Internet/TN3270 Solution

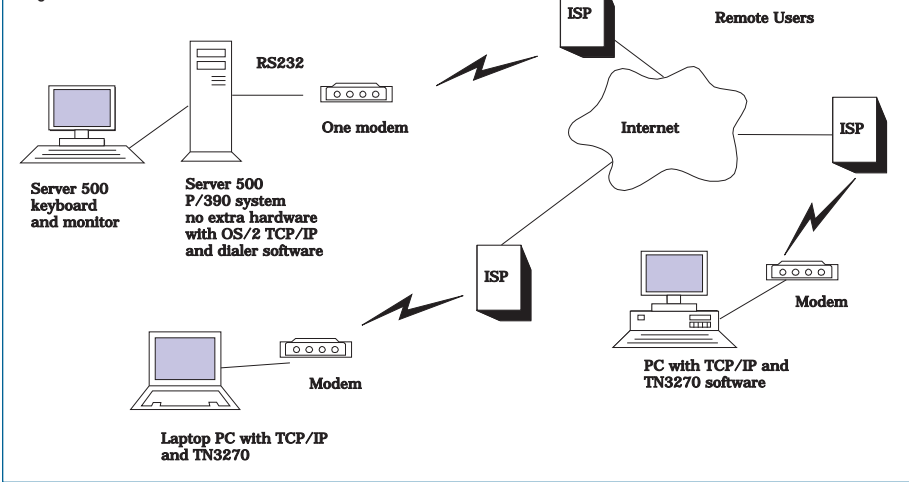
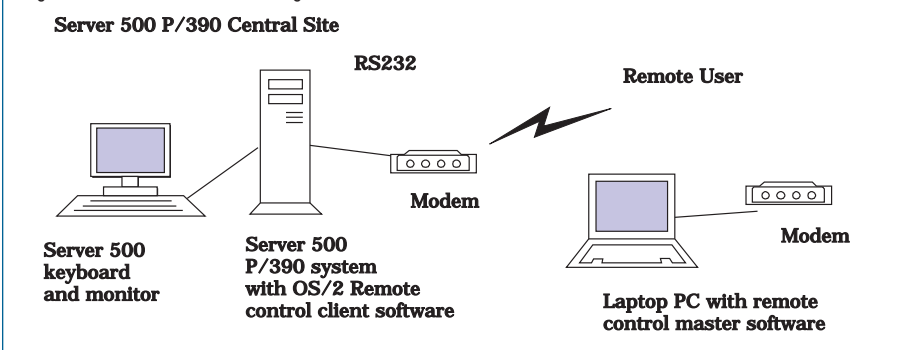


Figure 2: P/390 Remote Access Using OS/2 Remote Control Software



support software available November 1997.) Using an unusual port number, as opposed to the well known port 23, will help enhance security — one cannot hack what one cannot find! If the default of port=0000 is specified, the TCP/IP interface is disabled. When the configuration and IPL.CMD changes are complete, the P/390 must be shut down and restarted.

To summarize the server steps: A modem was selected and installed, MPTS and TCP/IP were installed and configured on the OS/2 side of the system, an ISP was selected, virtual 3270 devices were configured to use the LAN3274 device driver, and the TCP/IP port number was specified to the LAN 3274 driver. No changes were made on the MVS side, no MVS TCP/IP was needed, and no MVS TN3270 server was needed since the LAN3274 driver made the remote users look like channel-attached non-SNA dumb terminals.

**CLIENT ACTIVITIES**

First, a suitable client configuration had to be configured and tested. This configuration constitutes the suite of software and hardware that make up the remote user's workstation.

Of course, the remote users utilized nearly every platform under the sun except Macintosh! OS/2 was popular, with Windows 3.x and Windows 95 also desired as client platforms. In all cases, a TCP/IP suite, a dialer for the TCP/IP package and a TN3270 application had to be acquired, configured and qualified. If Internet access already existed on the client machine, only the TN3270 component would need to be installed, configured and qualified.

For OS/2, the components furnished with the OS/2 Warp Connect configuration appeared to be a very good fit. A TCP/IP suite, a dialer for both IGN (IBM Global Network, a.k.a. Advantis in the United States) and other ISPs, and a TN3270 client were all included in the package. I downloaded a copy of PCOM 4.x Lite (IBM's Personal Communications for OS/2) from the "get updates" site to replace the original TN3270 client. This combination has proven to be a suitable client package. Some configuration work was needed to set up the TCP/IP components, the appropriate dialer, and to set PCOM to use the TCP/IP interface. The dialer and TCP/IP were configured first; then, Internet connectivity

was established, then connectivity to the TN3270 server on the P/390.

For Windows 3.1, the set up was more complex. No TCP/IP component was furnished with the operating system. A TCP/IP stack had to be installed along with a dialer. Commercially available TCP/IP software was installed and functional, but was somewhat lacking in stability. A suitable TN3270 client was also required. Several packages were tested and found to be satisfactory. The IBM Personal Communications 4.0 full package worked but was rather pricey and had a very big virtual memory footprint, making it a memory hog. However, in some cases, this may be a good option simply because it is already installed on the workstation. The emulator of choice turned out to be QWS3270 PLUS from the Canadian firm of Jolly Giant Software, Inc. This package was inexpensive, had a minimal memory footprint and it worked well. Also, the vendor was very responsive to requests for enhancements.

For Windows 95, the task was easier. An adequate TCP/IP component and a dialer were included in the base operating system, which could be easily configured to connect and communicate with any ISP.

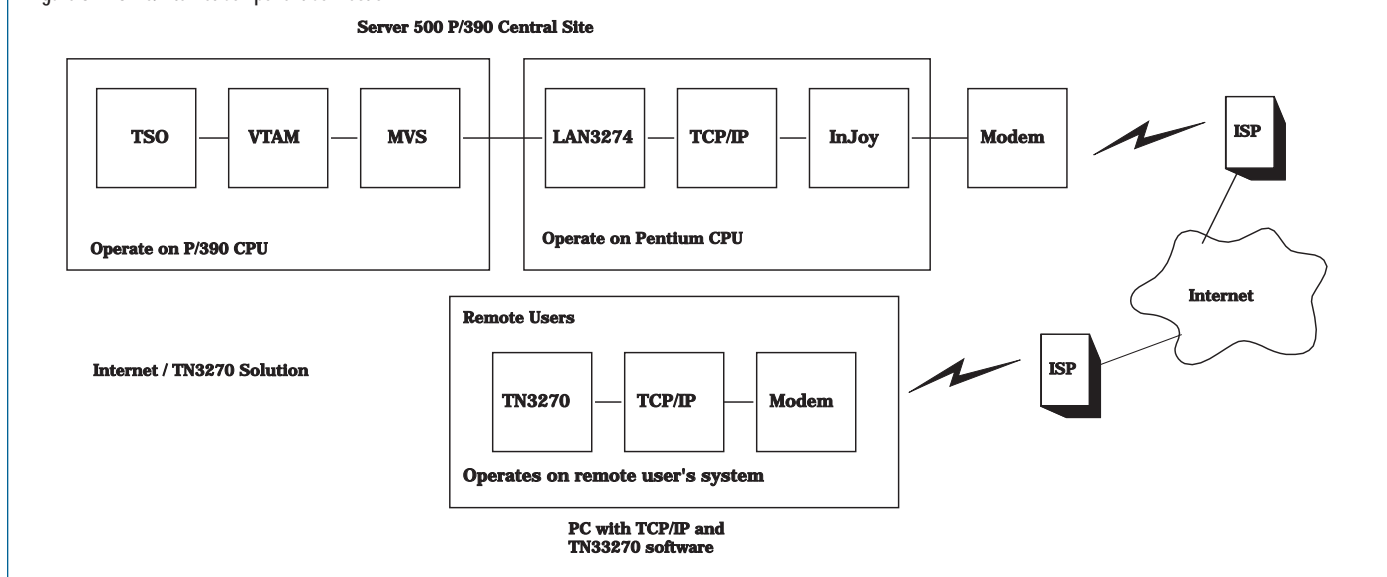
**Note:** The ISPs tend to have very good "getting started" instructions for this configuration. Once the base connectivity was established, all that remained was to select, install and qualify the TN3270 client. The same packages chosen for Windows 3.x were installed and both were qualified. Additionally, 32-bit versions of PCOMM and QWS3270 PLUS functioned satisfactorily. Again, QWS3270 PLUS was selected as the preferred package based on cost, small memory footprint and customer service. Function of both products was judged to be satisfactory and essentially identical for the task at hand.

**FURTHER ADVENTURES**

At this point, I had a working remote access facility for the P/390 system. Four concurrent remote users were able to log on to TSO on the system. The maximum number of remote users was limited by the number of virtual 3270s that had been configured to use the LAN3274 driver. A larger number is certainly feasible.

My initial usage experience was generally positive, except for difficulty in getting connected to the ISP. By having two ISPs

Figure 3: TN3270/Internet Component Connection



available, I had an alternative if I received a busy signal from the other. Additionally, I occasionally experienced a drop in the ISP connection. Both the absence of a re-dial on busy and the lack of a reconnection attempt on a line drop represented weaknesses in the OS/2-supplied dialer packages. Both situations required manual input on the OS/2 desktop to reconnect.

The overall picture of the connection to the ISP was not satisfactory. Deploying an OS/2 window while continuously running PING (at a low repetition rate) to another IP address generated a level of background traffic that helped keep the ISP from dropping the connection due to lack of use. However, this did use a small amount of bandwidth, server and router time. Researching via the Internet, I found some methods to wrap the OS/2-supplied dialer with REXX code to cause re-dial. I also found a replacement for the OS/2 dialers with a much better reputation: the InJoy package from F/X Communications. I was skeptical of this product but had become so frustrated with the system falling off-line that I downloaded a copy of InJoy. This package was installed and customized, miraculously without destroying any other packages during its installation. A "ticker" feature from F/X replaced PING to generate a very low rate traffic pattern, which keeps the connection active. The package provided a timeout facility that could shut down the link at a user-selected idle time. By providing the much richer dialer function on the server, the InJoy package remedied the fall-off

and busy signal problems. Both conditions still occur occasionally, but they only affect a user if the fall-off occurs during a session. Since very few hours of remote access are normally used per day, the fall-off during a session was a minor issue.

#### REMOTE CONTROL DEPLOYMENT

The OS/2 remote control approach was also deployed. The Remote Services Management Lite (RSM/Lite) client was installed on the Server 500 OS/2, while the master portion of the package was installed on an OS/2 image on a laptop. A separate modem was installed on a second serial port of the Server 500. A second phone line was deployed for this modem, so that the desktop could be taken over while the PPP link to the ISP and the Internet was active. Needless to say, this increased ongoing operating costs. However, deploying a modem such as the US Robotics Courier, which supports the distinctive ring feature provided by the phone company, was a less expensive approach than deploying a dedicated additional line for this second modem. With the distinctive ring feature two telephone numbers are assigned to a single line, each having a special ring. The modem only answers the second number's ring. Calls to the primary number are not answered by the modem. Thus, a single phone line could serve normal voice use and the occasional remote control modem usage.

The remote control solution is only used when access to either OS/2 resources (such as START P390) or full access to the MVS

console are required (i.e., IPL sequence). Performance is, at best, marginal, since the screen image is transmitted as bit maps. Telling RSM/Lite to use monochrome images helps improve performance, but it is still quite slow. Performance is adequate to the task at hand but would be marginal at best for serious TSO usage.

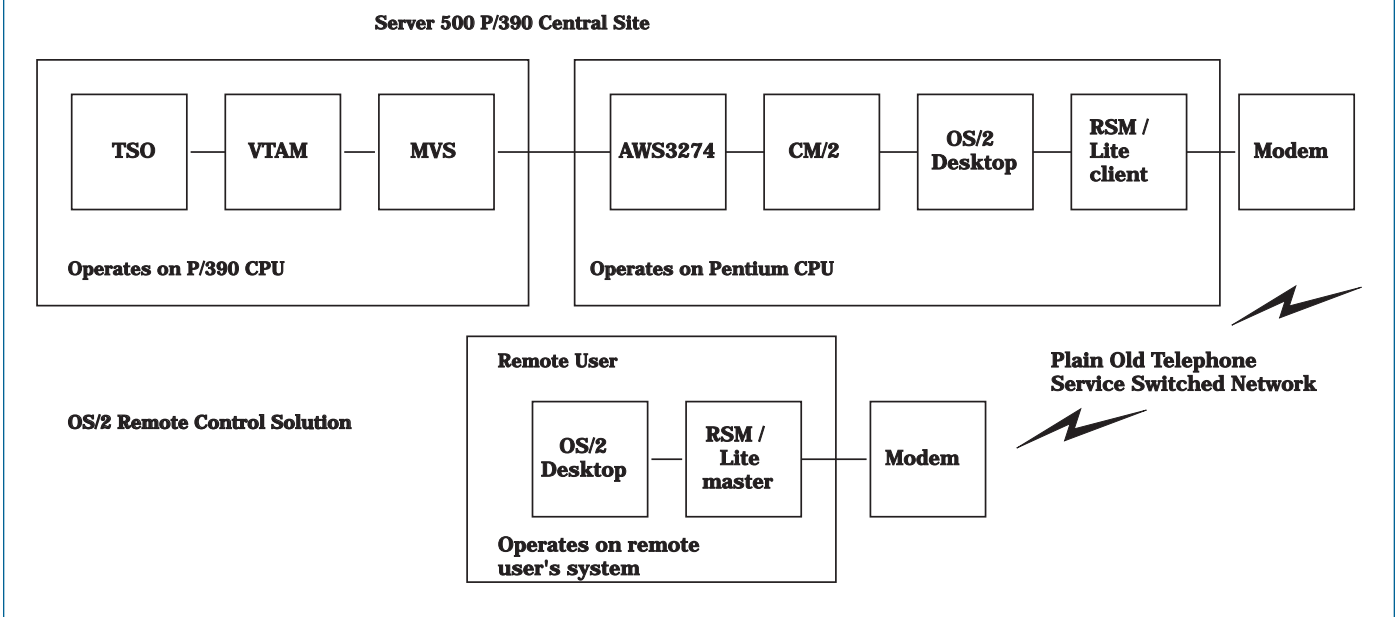
#### RESULTS TO DATE

This solution has now been in place a little more than a year and more than 500 hours of usage have been logged. Generally, the results have been very positive. The problems I've encountered generally have been reduced to annoyance level issues using proper bypass procedures. Performance has been satisfactory, with some exceptions: During periods of maximum Internet usage, response time may deteriorate, depending on which ISP is being used by a given client system and which ISP is being used by the Server 500 TN3270 server. If you can put all of the normal users on the same ISP, then performance is generally excellent, since the data only has to travel up the link from client to ISP, then across the ISP's LAN and down the link to the server. Of course, we've also seen 16 hops between client and server systems when two different ISPs are involved.

#### UNRESOLVED ISSUES

The weakest component of the solution has been the LAN3274 TN3270 server driver. This was brand new code when the project began and has shown improvement over the past year and a half. While further

Figure 4: OS/2 Remote Control Component Connection



development work is currently being done, particular problems are still unresolved:

- ◆ **Loops in the TN3270 server driver during IND\$FILE uploads:** This is a 100 percent failure for remote users. Download operations do not fail. Users using TCP/IP protocol connected via LAN, as opposed to via the Internet, do not fail. Since upload from the client workstation to the P/390 was a vital function and a fix for the driver was not available, another upload method was deployed to circumvent this problem. An OS/2 FTPD (FTP daemon or server) was set up on the OS/2 side of the Server 500. This server allowed files to be uploaded into the hopper of a virtual 2540 card reader (Yes, I know this shows that I have been in this business too long!) The client PCs also required deployment of an FTP client. The supplied 2540 driver would digest the files just like a card deck and then place them in another directory. This solution allowed easy upload of anything that was card image data. A JES2 reader was not deployed to the virtual 2540. Rather, a job using the IEBGENER utility with SYSUT1 pointing to the virtual card reader was used to copy any FTPed decks to an MVS data set. This bypass actually provides advantages over IND\$FILE solutions: Normal TSO activity can take place from a given client PC while the upload file transfer is taking place, FTP transmission is

typically faster than IND\$FILE, and the P/390 CPU overhead of IND\$FILE during the transmission is eliminated. At the time this article was written was written (November 1997), a new version of the TN3270 server driver appeared to have cured the loop problem. Deployment of the FTP solution may still be useful, especially if you expect to heavily utilize upload of card image data.


- ◆ **Lost sessions on line drops:** This condition has been observed when the communication link drops either between the ISP and the Server 500 or between the client PC and the ISP being used by the client. Several symptoms result. MVS thinks the user is still present; however, even “reconnect” doesn’t seem to work. Also, the TN3270 server thinks the user is still present, so the port is lost until the next restart of the P/390. By using a multi-session monitor such as TPX, the first problem is not an issue. Simply log on to another virtual terminal and steal your session from the former 3270 image. Without this type of function, you can log on with another user ID — perhaps with operator privilege — and cancel the hung session, of course with potential data loss. Then go back to the original session, or continue on the second user ID. Alternatively, wait 15 minutes until the user ID times out, then start up again. The more severe aspect of the lost session is the gradual loss of available virtual 3270s. Once a session is hung,

recovery of the virtual 3270 does not seem to occur. Further development of the TN3270 specification to the TN3270E level provides a way for the TN3270 server to send PING-like transmissions to the client on a periodic basis. The server could then make a decision that the client had gone away and simulate the appropriate condition to the P/390 as though a terminal had been turned off in mid-session. The newest version of the TN3270 driver (November 1997) appears to address this issue.

- ◆ **Inability of the remote user to select a specific virtual 3270:** An example would be the need to access the IMS MTO terminal. This terminal is at a specific LU address. While client applications such as QWS3270 PLUS provide the ability to request a specific LU as part of the TN3270E support, the TN3270 server package does not yet supply this functionality.

**SUMMARY**

Several methods were evaluated for remote access to the MVS P/390 system. The primary solution of Internet and TN3270 was chosen. Deployment of this solution with its multiple technologies and components created a learning curve. Multiple remote TN3270 client platforms were qualified over a variety of hardware and software platforms. OS/2-based remote control was also implemented for some special uses. The solutions have been in place for a year and a half and are

delivering usable, low cost results. As usual, there is a minor “bug and want list,” but most of these items can be worked around. 

---

**NaSPA member Rex Widmer is president of RWS, Inc. and a principle of the Edge Information Group, Inc. Rex has been in the systems programming field since the OS/360 days of PCP, MFT and the mighty MVT. He can be reached at [rwidmer@uit.net](mailto:rwidmer@uit.net).**

*©1998 Technical Enterprises, Inc. For reprints of this document contact [sales@naspa.net](mailto:sales@naspa.net).*