Licensed Program Specifications

TPNS
Teleprocessing Network Simulator
Version 3 Release 5
Program Number 5688-121

Teleprocessing Network Simulator (TPNS) is a telecommunications testing package that enables a user to test and evaluate application programs, communications access methods, and communication control programs without the use of actual terminals. The purpose of TPNS is to provide controlled generation of message traffic into a telecommunications subsystem or application through the use of programming rather than by large amounts of terminal hardware and terminal operator time. TPNS provides the ability to simulate a specified network of terminals and the associated messages, allowing the user to alter network conditions and message loads during a run. TPNS can thus be used to stress test telecommunications application programs with a large volume of messages to evaluate the reliability and approximate performance characteristics under expected operating conditions.

TPNS may be used to drive the online telecommunications system in the following ways:

- Simulate Start/Stop (S/S), Binary Synchronous (BSC), Synchronous Data Link Control (SDLC), logical link stations on an IBM* Token-Ring or Ethernet Local Area Network, or X.25 terminals and the networks to which they would be attached.
- Simulate Telnet 3270, File Transfer Protocol (FTP), or Simple TCP clients operating in a Transmission Control Protocol/Internet Protocol (TCP/IP) network.
- Simulate end stations in a frame relay network.
- Simulate SNA logical units (LUs) while executing as a VTAM* application program.
- Simulate an X.25 packet switching network.
- Simulate entire subareas in an SNA network.
- Simulate APPN* Type 2.1 end nodes.
- Simulate client or server transaction programs that use the Common Programming Interface Communications (CPI-C) Level 1.1.
- Generate data from descriptions of application messages and transmit real messages to a running telecommunications application program.
- Vary the frequency of message transmission within desired limits.
- Timestamp and log all messages sent from and received by the simulated terminals.
- Analyze the sending and receiving times to approximate application performance in response times and message rates. The user may also analyze the message contents for accuracy of data transmitted.

Utilizing an IBM 3745, 3720, or 3725 communication controller, TPNS supports a broad range of terminal types and provides flexible, generalized message generation facilities that can be used to simulate a wide variety of terminal operations. The following terminal and device types are simulated by TPNS:

- Start-stop communication terminals on leased communications facilities:
  - IBM 1050 Data Communication System
  - IBM 2740 Communication Terminal Model 1 (with station control and record checking)
  - IBM 2740 Communication Terminal Model 2 (with station control, record checking, and buffered receive)
  - IBM 2741 Communication Terminal
  - IBM 3101 Display Terminal (block mode, half-duplex mode, break sent but not received)
  - IBM Displaywriter (communicating as a 2741 or Model 33/35 TWX)
  - Western Union Model 33/35 TWX terminal (half-duplex mode, break sent but not received).

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- Start-stop communication terminals on switched communications facilities:
  - IBM 3101 Display Terminal (block mode, half-duplex mode, break sent but not received)
  - Western Union Model 33/35 TWX terminal (half-duplex mode, break sent but not received).
- Binary Synchronous Communication Terminals:

  TPNS supports the following IBM 3270 Information Display System BSC terminals:
  - 3271 Models 1 and 2
  - 3174 Models 1R, 51R, and 81R
  - 3274 Models 21C, 31C, 41C, 51C, and 61C
  - 3275 Models 1 and 2 (non-switched)
  - 3275 Models 1 and 2 with a 3284-3 (non-switched)
  - 3276 Models 1, 2, 3, and 4
  - 3179 (non-Model G)
  - 3180
  - 3191
  - 3192 (non-Model G)
  - 3194
  - 3268
  - 3277
  - 3278
  - 3279
  - 3284
  - 3286
  - 3287
  - 3288
  - 3289
  - 3290
  - IBM PS/55 executing IBM 3270 DBCS emulator (text only)
  - IBM InfoWindow* 7672 Model JC1 (text only)

  These terminals can use EBCDIC or ASCII.

  In addition, TPNS supports the following IBM BSC line disciplines:
  - BSC1 (point-to-point leased BSC)
  - BSC2 (point-to-point dial BSC; terminal answer only)
  - BSC3 (multipoint BSC).

  The types of terminals that you can simulate using these BSC line disciplines include:
  - IBM 1130 Computing System
  - IBM 1800 Data Acquisition and Control System
  - System/3
  - System/7
  - System/34
  - System/36*
  - System/38*
  - System/360*
  - System/360 Model 20
  - System/360 Model 25
  - System/370*
  - IBM 2770 Data Communication System
  - IBM 2780 Data Transmission Terminal
  - IBM 3780 Data Communication Terminal
  - IBM 6670 Information Distributor
  - IBM 8100 DPPX Information System
  - IBM Displaywriter (communicating as a 2770, 2780, or 3780).

  Note: TPNS does not support the special features of these BSC1, BSC2, and BSC3 devices. However, you can code this support.
- Airline Line Control (ALC) terminals, using an IBM 3745 communication controller.
- Multileaving Model 20 Workstation in transparent mode only.
- Synchronous Data Link Control (SDLC) line discipline for Systems Network Architecture (SNA) terminals on leased half-duplex, leased full-duplex, or dial communication facilities.
  - IBM 3270 Information Display System
    - 3271 Models 11 and 12
    - 3174 Models 1R, 2R, 51R, 52R, 81R, and 82R
    - 3274 Models 21C, 31C, 41C, 51C, and 61C
    - 3275 Models 11 and 12 (non-switched)
    - 3275 Models 11 and 12 with a 3284-3 (non-switched)
    - 3276 Models 1, 2, 3, 4, 11, 12, 13, and 14
    - 3277
    - 3178
    - 3179 (non-Model G)
    - 3180
    - 3191

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    - — 3192 (non-Model G)
    - — 3194
    - — 3268
    - — 3278
    - — 3279
    - — 3284
    - — 3286
    - — 3287
    - — 3288
    - — 3289
    - — 3290.
  - IBM PS/55 executing IBM 3270 DBCS emulator (text only)
  - IBM InfoWindow 7672 Model JC1 (text only)
  - IBM 3600 Finance Communication System
  - IBM 3650 Retail Store System (supported as 3600 compatible device)
  - IBM 3660 Supermarket System (supported as 3600 compatible device)
  - IBM 3614 Consumer Transaction Facility
  - IBM 3624 Consumer Transaction Facility
  - IBM 3730 Distributed Office Communication System
  - IBM 3767 Communication Terminal
  - IBM 3770 Data Communication System
  - IBM 3790 Communication System
  - IBM 4700 Finance Communication System (supported as 3600 compatible device)
  - IBM 5250 Display Station (5251 Display Station and 5256 Printer)
  - IBM 8100 Information System
  - IBM 8775 Display Terminal
  - System/34
  - System/36
  - System/38
  - General support for all cluster controllers (PU Type 2 terminals)[1]
  - General support for terminal nodes (PU Type 1 Terminals)
  - General support for peripheral nodes (Type 2.1 nodes)
  - General support for SNA subareas.

Note: TPNS SNA simulation is not intended to simulate code internal to the logical control unit other than that code required to transmit and receive message traffic. However, presentation services are handled for 3270 Information Display System, 5250 Information Display System, and 8775 Display Terminal simulation.

- 8100 processor devices attached with telecommunication links or remote loops (for use when the system under test is an 8100 processor):
  - IBM 3289 Model 3 Line Printer
  - IBM 3641 Reporting Terminal
  - IBM 3642 Encoder Printer
  - IBM 3643 Keyboard Display
  - IBM 3644 Automatic Data Unit
  - IBM 3645 Printer
  - IBM 3646 Scanner Control Unit
  - IBM 3647 Time and Attendance Terminal
  - IBM 3276 Control Unit Display Station
  - IBM 3278 Display Station
  - IBM 3287 Printer
  - IBM 3289 Printer
  - IBM 8775 Display Terminal.
- X.25 packet switching network with the following attached start-stop communication terminals:
  - 3101 Display Terminal (block mode, half-duplex mode, break sent but not received)
  - IBM 3161/63 Display Terminal (3101 Emulation mode)
  - Western Union Model 33/35 TWX Terminal (half-duplex mode, break sent but not received).
- SNA terminals in an X.25 packet switching environment on leased full-duplex communication lines:
- IBM 3270 Information Display System
- IBM 3600 Finance Communication System
- IBM 3650 Retail Store System (supported as 3600 compatible device)
- IBM 3660 Supermarket System (supported as 3600 compatible device)
- IBM 3614 Consumer Transaction Facility
- IBM 3624 Consumer Transaction Facility
- IBM 3730 Distributed Office Communication System
- IBM 3767 Communication Terminal
- IBM 3770 Data Communication System
- IBM 3790 Communication System
- IBM 4700 Finance Communication System (supported as 3600 compatible device)
- IBM 5250 Display Station (5251 Display Station and 5256 Printer)
- IBM 8100 Information System
- IBM 8775 Display Terminal
- System/34
- System/36

[1] The LU7 controller support for PU Type 2 terminals is at the level supported by the IBM 5251 Display Station.

- System/38
- General support for all cluster controllers (PU Type 2 terminals)
- General support for terminal nodes (PU Type 1 terminals)
- General support for peripheral nodes (Type 2.1 nodes)
- General support for SNA subareas.

The following is a partial list of functions not supported by TPNS.

- TPNS does not support the following 3270 functions on an LU Type 2:
  - Vector-to-Rastor Graphics (3179-G1, 3179-G2, 3192-G)
  - Image Support (3193)
  - PC File Transfer
- TPNS does not support the following 3174/3274 functions:
  - LU 6.2 session for Central Site Change Management (CSCM)[2]
  - 3174/3274 Printer Authorization Matrix for local copy printing
  - 3174 Local Format Storage (LFS)
- TPNS does not support the following X.21 functions:
  - X.21 Switched
  - X.21 Switched using Short Hold Mode (SHM)
- TPNS does not support the following X.25 functions:
  - X.25 INN links supporting SHM
  - X.25 Enhanced Logical Link Control (ELLC)
- TPNS does not support the following TWX functions:
  - TWX or 3101 using character mode (full-duplex, echo-plex)
  - TWX or 3101 receiving Break
- TPNS does not support BSC ASCII Transparent
- TPNS does not support the following SNA functions:
  - SNA Network Interconnect (SNI) NCP simulation (Gateway Nodes).
  - Gateway NCP or Gateway VTAM simulation.
  - RHO simulation through channel attachment to a real NCP. TPNS ONLY supports RHO simulation through leased line SNA PU type 1 or PU type 2.
  - Extended Recovery Facility (XRF) support for RHO or simulated NCP.
  - Dynamic resource definition for RHO.
- TPNS does not support the sync-point synchronization level for conversations between CPI-C transaction programs.
- TPNS does not support Open Systems Interconnection (OSI)[2]
- TPNS does not support local terminal simulation via channel attachment or Input/Output Supervisor (IOS) hook
- TPNS does not support VISA** start/stop using BSC protocol, multidrop, otherwise known as "VISA Credit-Card TALTEK (757) Point-of-Sales Terminals"
- TPNS does not support user control of the link layer protocols.

SNA logical units can also be simulated by TPNS while executing as a VTAM application program. This mode of execution eliminates the need for a communication controller in some testing environments. General support is provided for LU types 0-7, with special support for the LU2, LU3, and LU7 data streams. This function can be used to test user-written applications or host system software, or it can be used with other VTAM facilities (such as cross-domain or cross-network communications or channel-to-channel communications) to test resources throughout a network.

CPI-C transaction programs (TPs) can be simulated by TPNS while executing as a VTAM application program. This function can be used to test

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[2] TPNS may be able to simulate the function needed if the user writes a STL program or TPNS message generation deck that simulates the function. This usually requires a detailed level of understanding of the function.

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applications or to do stress or performance testing. Existing applications, or applications that are under development, can be tested. This function can be used to simulate client TPs, server TPs, or both, in any communication system that uses LU type 6.2 protocols.

TPNS can simulate TCP/IP clients executing Telnet 3270, File Transfer Protocol (FTP), or simple TCP protocols by establishing multiple connections through the IBM TCP/IP for MVS* or the IBM TCP/IP for VM products to the system or server under test.

Another level of simulation provided by TPNS is the simulation of an entire system in a Multisystem Networking Facility (MSNF) environment. In simulating such a system, TPNS performs the functions of the System Services Control Point (SSCP), the Network Control Program (NCP), and the physical and logical units in the system. The logical units in a simulated system generate messages in the same way that same-domain terminals simulated by TPNS generate messages. Subareas in the simulated system are supported independently by TPNS. Each subarea can be specified as supporting extended network addressing (subarea address of 1 through 255 and element address of 1 through 32,767) or extended subarea addressing (subarea address of 1 through 65,535 and element address of 1 through 32,767). A simulated NCP subarea may have the following attachments: real link attachments to one or more communication controllers executing NCP, simulated link attachments to other simulated NCP subareas, and simulated channel attachments to simulated host subareas. A simulated host subarea may have the following attachments: real channel attachments to one or more communication controllers executing NCP and simulated channel attachments to simulated NCP subareas. A real SSCP, for example VTAM, can activate and deactivate a simulated communication controller and its underlying resources (link, physical units, logical units).

TPNS also simulates IBM Token-Ring and Ethernet local area network resources.

In addition to simulating terminals and subareas on remote links, TPNS provides simulation support for an X.25 packet switching network. The specific X.25 facilities supported are consistent with the IBM interpretation of the CCITT Recommendation X.25 (Geneva, 1980), and the CCITT Recommendation X.25 (Malaga-Torremolinos, 1984). TPNS provides three different types of X.25 interfaces:

- TPNS appears as one or more data circuit-terminating equipment (DCE) interfaces to the system under test; i.e., TPNS simulates an entire packet switching network including the data terminal equipment (DTE) devices.
- TPNS appears as multiple DCE interfaces to the system under test, simulating a packet switching network between real DTEs. This form of simulation is called "pass-through" and is independent of end-to-end protocols (such as SNA) and the types of DTEs involved.
- TPNS appears as one or more DTEs to the system under test which may be a real packet switching network.

Each X.25 interface simulated by TPNS can support multiple permanent and/or switched virtual circuits. TPNS will simulate a variety of DTEs including SNA terminals using PSH or QLLC protocols for logical link control, SNA subareas using QLLC protocols, and X.25 native equipments.

TPNS also supports an X.25 packet switching network and the 3101 or TWX type terminals attached to it using X.3 and X.29. For this type of simulation, TPNS appears as the DCE interface to the system under test and the packet assembly/disassembly (PAD) facility is transparent to the TPNS user.

Scripting facilities are provided by the TPNS language. The script describes the terminals, network configuration, and message rates desired by the user. In addition, the script defines telecommunications messages meaningful to the on-line application programs under test. Individual segments of information in the messages may be generated by different methods including random selection, table lookup, and constant insertion. TPNS provides a logic test capability of comparing for certain data or text received or sent by TPNS. Thus, scripts can vary message data from the

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simulated terminals based on the content of a prior response from the application program.

Preparation of scripts is simplified by providing common default values for the keyword parameters used in the scripting language. Messages may be generated from a single script for multiple terminals.

The TPNS Structured Translator Language (STL) and the TPNS STL Translator are provided to enhance script preparation. STL is a high-level, structured programming language used to specify the control logic and message traffic for devices simulated by TPNS. The main advantages of STL are ease of use and increased productivity. The STL Translator provides syntax checking and converts the STL program into message generation decks, which are executed by TPNS.

TPNS supplies an Interactive System Productivity Facility (ISPF) panel interface compliant with SAA/CUA* guidelines. This helps both new and experienced TPNS users set up and start TPNS and its utilities.

A sample VTAM application program with sample TPNS message scripts is provided with TPNS. The primary function of this application is to echo data received from the terminals. This facility may be used for initial testing of a TPNS installation.

A message generation trace facility is available to aid in script debugging by providing a listing of the steps through message generation for a simulated terminal. A device level option specifies that trace records are to be written to the log data set. This facility also traces the execution of logic tests. The TPNS Loglist Utility post-processor program will format the trace records from the log data set.

Multiple networks may be simulated concurrently within a single TPNS job to provide messages to drive multiple telecommunications applications or multiple CPUs. A separate log data set may be specified for each network.

Four script generating utilities are provided to allow the user to automatically generate TPNS message generation decks. Data is supplied to each script generator program via a different method.

Note that TPNS does not provide an automatic script generating facility for CPI-C simulations.

One method of generating scripts is the TPNS Interactive Data Capture (IDC) utility. This utility lets users interactively capture 3270 device session data and generate STL programs or TPNS message generation decks. Users log on to it, then log on to the VTAM application they want to test, and perform the actions they want TPNS to simulate. When they are done, IDC generates either an STL program or a TPNS message generation deck.

Another method of generating scripts is to supply the Script Generator Utility with data captured during the running of an on-line application. The user must specify only the network configuration statements and provide these, along with the captured data, as input to the script generator. The network configuration statements may be updated by the script generator program to reflect the message generation decks generated. TPNS provides a reformat routine to convert the following to the format required by the script generator:

- VTAM buffer trace
- Network Performance Monitor (NPM) VTAM Log.

Captured LU Type 2 data in the same format as an NPM VTAM log data set can also be converted to a TPNS log data set and used by the Log Script Generator Utility (part of IDC) to generate STL programs or TPNS message generation decks.

A third method of generating scripts is to use the TPNS Application Test Processor (TPNS/ATP) utility. This utility uses MFS based screen definitions as input to generate TPNS scripts. The user defines test cases made up of various screen definitions, and supplies the network configuration statements. TPNS/ATP will modify the network configuration statements to reflect the message generation decks generated.

The fourth method provided for generating scripts is ITPBTS, a utility which converts Batch Terminal

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Simulator (BTS) input statements into TPNS message generation statements.

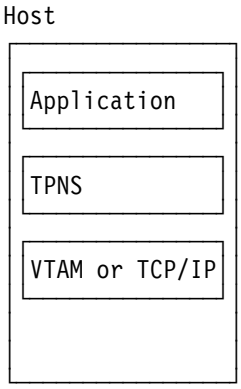
TPNS can perform simulations in the following environments:

- GCS
  - Command interface
  - TPNS interface to the NetView* operator
- MVS
  - Batch job
  - Started procedure
    - Modify interface
    - TPNS interface to the NetView operator
- TSO
  - TPNS/ISPF Interface
  - User-written interface
  - CLISTs.

TPNS can operate either in the same host processor as the system under test or in a separate processor. It is not necessary that the host processors be dedicated to the test run, although this may be desirable when making critical application performance approximations.

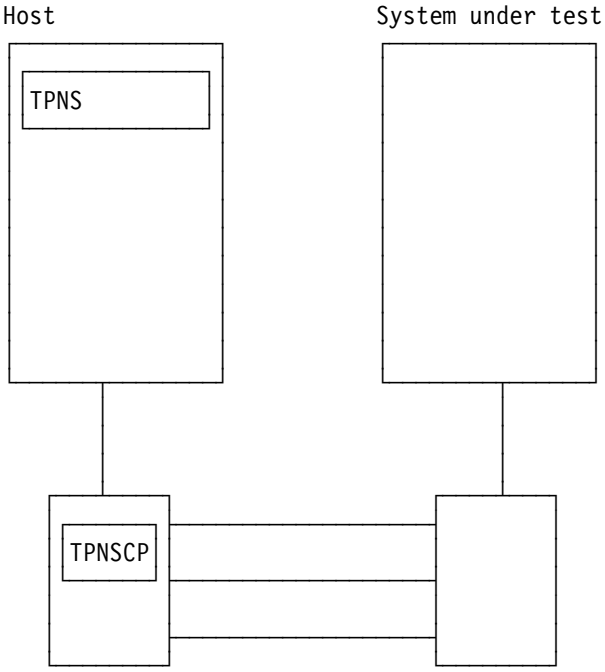
One of three different physical configurations is required to run TPNS, depending on the type of simulation to be performed.

In the first configuration, TPNS uses VTAM or IBM TCP/IP to provide connectivity to the system under test. TPNS and VTAM, or TPNS and TCP/IP, execute in the same host processor, and connections are established between TPNS LUs or TCP/IP clients and the system under test. This physical configuration is illustrated in the following figure:



TPNS can drive various application programs running under IBM data communication programs such as IMS*, CICS*, VSPC, TSO, BTAM, TCAM, TPF, and VTAM.

In the second physical configuration, TPNS requires a dedicated communication controller. Such a configuration is necessary when simulating non-SNA terminals, and may be desirable for certain SNA terminal and domain simulations.



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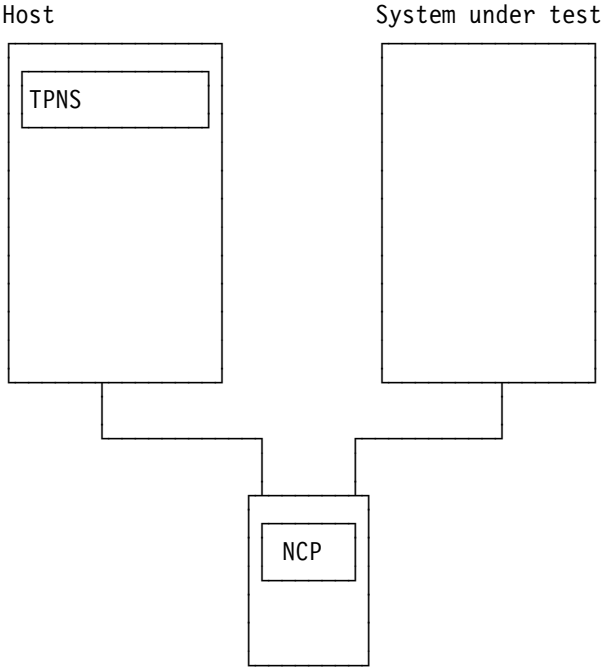
In the third physical configuration, TPNS can share a communication controller executing NCP with ACF access methods in a multitail environment (neither a dedicated communication controller nor a TPNS control program is necessary) for subarea or Boundary Channel Attached Type 2.1 end node simulation. This last physical configuration is illustrated below:



A preprocessor program is provided to check the syntax of network configuration and message generation statements. Three post-processor programs are provided: one to list the TPNS log data set in a formatted report, one to calculate a response time analysis selectively by network communication resource and one to compare the 3270 screen images from two log data sets.

The log data set formatting program has the capability of analyzing the message traffic on the log data set for display terminals and constructing formatted screen images to be printed. The screen formatting feature is available for all terminals in the IBM 3270 Information Display System, the IBM 5250 Information Display System, and the IBM 8775 Display Terminal.

The response time calculated by the post-processor is the time required for the application to respond to an input message. The user has as an option the ability to write a response time analysis program using the various TPNS time stamps. TPNS also provides functions for graphing the results of the analysis program.

The log compare program compares the entire 3270 screen image from two log data sets, unless otherwise specified. The user can use input commands to restrict what is to be compared.

Specified Operating Environment

Machine Requirements

TPNS Version 3 Release 5 is designed to run in a virtual storage environment in any IBM system configuration that supports the operating systems listed under “Programming Requirements.”

One tape drive or one disk data set is required if message logging is selected. Multiple tape drives may be specified for alternating tape reels of log messages.

For TPNS simulation runs, DASD storage space is required for the following data sets:

- User network and message definition statements
- TPNS object modules and load modules
- TPNS control program macros (optional)
- Rate tables (optional)

See *TPNS Planning and Installation* for space requirements for these data sets.

To support running as a VTAM application, TPNS requires VTAM. To simulate CPI-C transaction programs, TPNS requires VTAM Version 3, Release 2 or later.

For the simulation of remote terminals or cross-domain communication via SDLC or Token-Ring links, TPNS requires a 3745, 3720, or 3725 communication controller that will execute a TPNS control program. For cross-domain communications or Boundary Channel Attached Type 2.1 end node simulations, TPNS can be channel-attached to a 3745, 3720, or 3725 communication controller and share an NCP with other SSCPs. For execution as a VTAM application program, a CPI-C transaction program, or an IBM TCP/IP application program, TPNS requires no communication controller or other unique hardware in addition to the processor in which it is executing.

To support simulation of Telnet 3270, FTP, or simple TCP clients, TPNS requires one of the following:

- For MVS, IBM TCP/IP (5735-HAL; Version 2 Release 2 or later) or IBM TCP/IP for MVS (5655-HAL; Version 3 Release 1 or later)
- For VM, IBM TCP/IP (5735-FAL; Version 2 Release 2 or later).

Each remote line or cross-domain link to be simulated by TPNS must have a physical connection between the communication controller allocated to TPNS and the one allocated to the system under test. *Defining TPNS Networks* discusses some link connection alternatives as well as information for estimating communications controller storage requirements.

For the simulation of logical link stations on an IBM Token-Ring or Ethernet Local Area Network, TPNS requires a TPNS control program to be executing in one of the following:

- A 3745 hardware and microcode environment with the appropriate IBM Token-Ring or Ethernet Adapter, or
- An ES/9370* equipped with an IBM Token-Ring adapter, or
- A 3720 Model 11, or
- A 3725 Release 4 hardware and microcode environment with the appropriate IBM Token-Ring adapter.

Programming Requirements

TPNS runs in a virtual storage environment in any IBM system configuration that supports:

- MVS/370 (MVS/SP* Version 1, 5752-VS2)
- MVS/ESA* (MVS/SP Version 3, 5685-001 for JES2 or 5685-002 for JES3)
- MVS/XA* (MVS/SP* Version 2, 5740-XC6 for JES2 or 5665-291 for JES3)
- VM/SP 370 (5664-167, Release 4 or later)
- VM/SP HPO (5664-174, Release 4 or later)
- VM/SP XA (5664-308, Release 2)
- VM/ESA*

as specified in the Programming Requirements section of this announcement. This licensed program operates on the IBM System/390* processors, the IBM System/370 processors (including ES/9370), and 3090* processors.

TPNS also runs on subsequent releases or modifications of the above operating systems, unless otherwise stated in the announcement documentation of the future release or modification of the operating system or of TPNS.

To support communication with a TPNS control program or NCP running in a 3745, 3720, or 3725 communication controller, TPNS requires the loader and assembler utilities of the Advanced Communications Function System Support Program (SSP) program product, as indicated by the following:

- For MVS, SSP Version 3 Release 3 (5665-338) or later
- For VM, SSP Version 3 Release 4 (5664-289) or later.

The virtual region size required for executing TPNS is dependent on the size and characteristics of the configuration being simulated. *TPNS Planning and Installation* contains information for calculating storage requirements. The TPNS preprocessor will report the control block size required for a specific TPNS network.

Licensed Program Materials Availability

Restricted Materials – No. This licensed program is available without source licensed program materials. It is available in object code.

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Supplemental Terms

Designated Machine Identification

Designated Machine Identification Required: Yes.

Testing period

The testing period is two months for the North-Central and South-West Marketing Divisions and 60 days for Europe/Middle East/Africa, Americas Group, and Asia/Pacific Group.

Installation/Location License

- Not applicable.

Usage Restriction

- Not applicable.

Type/Duration of Program Services

Central Service, including a Support Center, will be available until discontinued by IBM upon six months' written notice. Programs in this specification are supported by the TPNS Support Center. Access to this Support Center will be provided through the IBM Support Center.

Softcopy Publications

All the publications in the TPNS library are available in softcopy form on the *IBM Networking Softcopy Collection Kit*, SK2T-6012. This kit uses the CD/ROM medium.

Warranty

This program is warranted as specified in the IBM license.

Licensed Program Specifications may be updated from time to time, and such updates may constitute a change in specifications.

Following the discontinuance of all program services, this program will be provided “As Is” as specified in the IBM license.

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