



The TN3270 Server on S/390

The Right Choice for Your Network

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Are all TN3270 servers basically the same?

While there are many different vendors of TN3270 servers¹ in the market, there are really only two types - outboard servers and the S/390 inboard TN3270 server. Before making functional comparisons between these TN3270 server solutions, it is vital that one understand the basic differences in the structural models. From a SNA perspective, the outboard TN3270 server looks like a SNA PU type 2 (e.g., 3174 Controller) and the TN3270 clients look like dependent LUs (e.g., 3270 Terminals). From this same SNA perspective, the inboard S/390 TN3270 server looks like an SNA session manager with each TN3270 client looking like a separate VTAM application.

Because S/390's view of the SNA session remained unchanged for outboard TN3270 servers, the migration impact for a customer moving from SNA 3270 LUs to TN3270 clients was minimized. This aspect more than any other originally made outboard TN3270 servers the customer choice. Outboard servers also allowed certain key VTAM functions to work identically as if in a pure SNA 3270 environment (e.g. USS support). While the outboard model was initially beneficial, it has aspects (e.g. SNA needed in the WAN) that are undesirable as companies move to take advantage of the Internet for their SNA applications. Functions, which initially were only supported by outboard TN3270 servers, will be available with V2R10 on the S/390 TN3270 server. In addition new functions have been added which give the S/390 TN3270 server some major competitive advantages over outboard TN3270 servers.

¹The term TN3270 server used in this document represents a server that supports both standard TN3270 clients as well as TN3270E clients. If a function is specific to TN3270E client support then the term TN3270E server will be used.

What are the advantages of the S/390 TN3270 Server?

Many of the S/390 TN3270 server advantages derive from the fact that it has both a SNA and a TCP/IP appearance. Since the S/390 TN3270 server structure is that of a SNA session manager, there are usability, scalability, and management functions that cannot be provided or are very limited with the outboard approach (dependent LUs). And, since the S/390 TN3270 server is also a S/390 TCP/IP application, there are functions in Communications Server for OS/390 (CS/390) that greatly enhance the security, performance, and availability of the inboard server.

Scalability

In addition to the scalability provided by the S/390 hardware, there are two VTAM features: enhanced addressing for session managers and application cloning, that the S/390 TN3270 server, as a SNA application, can use to increase scalability.

Enhanced addressing for session managers was added in V2R7 to provide high order addressing for single session applications. With this support the TN3270 clients are not part of VTAM's 64K resource limit allowing far greater scalability than in prior releases. In contrast, an outboard TN3270 server cannot use high order addressing unless it is also defined as a DLUR (an APPN definition). And, even if, the outboard TN3270 server is defined as a DLUR device, it is still seen as a PU type 2 and is limited (by LOCADDR) to 255. This means that for every group of 255 LUs, another outboard TN3270 server must be defined to VTAM. The S/390 TN3270 server does not have this limitation so it is more scalable and TN3270 client growth has far less impact on administration and management.

Application cloning also improves usability while providing superior scalability. An application model containing wild cards (i.e. *

or ?) can be used to represent a group of TN3270 clients with the same characteristics. This reduces the amount of definitions needed to represent the TN3270 client population and also reduces the associated network resources and storage needed to define the TN3270 workload. The application representing a TN3270 client is dynamically created upon client connect (OPEN ACB) and deleted during disconnect (CLOSE ACB) - network resources and storage are used only while the client has an active connection. With application cloning, the customer has the flexibility of relocating the S/390 TN3270 server to another OS/390 image or redirecting the client to another S/390 TN3270 server without the fear of residual definitions in the original VTAM causing confusion.

Management

The S/390 TN3270 server supports full visibility of the TN3270 client's IP characteristics (IP address, IP port, and DNS name). SNA side visibility of the TN3270 client's IP characteristics is key for network/application management. Operator commands and USS messages provide operators and end-users with both the IP and SNA connection identities. Connection problems between the TN3270 client and the SNA application can be quickly identified and resolved. Later in this paper, we will discuss how V2R10 extends visibility so that the IP characteristics can be used for customization, problem diagnosis, authorization, and accounting.

Performance

OS/390 enables an administrator to specify QoS policy with the Service Policy Agent and control the priority of a particular application workload. The Service Policy Agent is a daemon in OS/390 that ensures the differentiated services field in the outbound IP datagrams corresponds to the priority specified for that application workload. OSA Express adapters and Cisco routers use differentiated services for priority queuing algorithms, providing mapping to four priority queues corresponding to network, high, medium, and

low priority. During a IBM/Cisco joint quality of service test incorporating OSA Express and Cisco routers, a four times improvement in average response time for the interactive TN3270 traffic was obtained. For more information concerning the joint IBM/Cisco QoS testing, refer to the white paper, [Delivering Predictable Host Integration Services](#).

Security

Since OS/390 V2R6, the S/390 TN3270 server has supported secure connections with SSL enabled TN3270 clients via specification of a unique dedicated SSL port. This level of SSL support is also available on a few outboard TN3270 servers but with V2R8, the S/390 TN3270 server adds SSL client authentication to provide security mechanisms unique to S/390. SSL client authentication validates, via RACF, the digital X.509 certificate passed from the TN3270E client on the initial SSL connection exchange. This ensures that the client is a trusted client prior to allowing any access to the TN3270 server and its corresponding host. This additional level of security is especially important if the TN3270 clients are using the Internet to gain data center access. More information on this support and other TN3270 SSL enhancements will be provided in a future white paper.

Availability

DNS together with Work Load Manager (WLM) support provided in OS/390 V2R5 significantly reduces the impact of an inboard TN3270 server outage by spreading the effected workload across multiple servers within the parallel sysplex according to predefined goals. Allowing new TN3270 client connections to bypass down servers also increases availability. This availability increase is dependent on TN3270 clients (and primary DNS nodes) to not cache the IP address returned by the DNS on the initial name resolution. Unfortunately, many vendor provided TN3270 clients and primary DNS nodes cache the IP address of the server (i.e., they do not honor the time-left value of zero passed by the DNS). Fortunately dynamic

virtual IP addressing (VIPA) support in OS/390 V2R8 can be used to relocate the VIPA representing the TN3270 server, allowing even those TN3270 clients with a cached IP address to quickly establish a new connection to another TN3270 server (or the same server restarted).

In addition, TN3270 clients with active connections (at the time of the server outage) are quickly reset via a connection reset from the backup stack. The client does not have to wait several minutes for time-out prior to reestablishing the TN3270 server connection (either via DNS resolution or by using the cached IP address). On average, this yields a reduction of 60%² in the time needed for recovery of a TN3270 workload. Takeover of a dynamic VIPA can also be used with a single TN3270 server instance or with a DNS round-robin approach to workload balancing. We will later discuss another workload balancing function in V2R10 called Sysplex Distributor that provides a whole new level of availability and workload balancing in a parallel sysplex.

Another important S/390 TN3270E server availability function is Fast Reconnect of TN3270E clients that explicitly specify their SNA LU name. It is fairly common for a TN3270E client to be notified that it no longer has a path to its TN3270E server due to a local outage. Unfortunately, client reconnect can be delayed as a result of the TN3270E server incorrectly assuming the client trying to reconnect is a new TN3270E client attempting to use an already allocated SNA LU. This is due to the TN3270E client discovering its TN3270E server connection has been broken long before the TN3270E server discovers this fact by way of an inactivity timer or connection time-out. The Fast Reconnect support allows the TN3270E server to send a time-mark to the client over the original connection to see if the original client responds. The system administrator can specify how long the TN3270E server should wait to determine whether the original

connection has been broken before allowing reconnect to occur. The TN3270E server authenticates the client on the reconnect request using the original connect criteria ensuring secure reconnect. Later we will discuss a V2R10 enhancement to the Fast Reconnect support which allows the SNA session to be preserved during the TN3270E client reconnect - further improving overall availability and making more efficient use of network resources.

What's new in V2R10 for the S/390 TN3270 Server?

Sysplex Distributor

The Sysplex Distributor function forwards TCP/IP connection requests to those replicated application servers within a parallel sysplex that are identified by a specific dynamic VIPA and port. When a dynamic VIPA becomes a sysplex wide VIPA address, workload can be distributed to the replicated server instances without incurring network setup delay - no changes to clients or networking hardware are required. Because the Sysplex Distributor function resides in the parallel sysplex itself, it can factor "real-time" status information concerning the replicated server instances as well as QoS and Policy information provided by CS/390's Service Policy Agent. By combining these "real-time" factors with the information obtained from WLM, the Sysplex Distributor is unique in its ability to choose the best destination TN3270 server instance for a particular client connection and ensure that client/server specific Service Level Agreements are maintained.

In addition, the sysplex distributor now enables the Dynamic VIPA (V2R8) to be moved back to the primary TCP/IP stack upon resolution of a system outage. This is accomplished without impacting client connections established with the backup server. Sysplex distributor also allows TN3270 workload to be redirected to other servers in preparation for planned outages (i.e. drain the workload on an existing

²Results achieved in a dedicated test environment. Customer results may vary.

TN3270 server prior to bringing the server or its host down for planned maintenance).

Autologon Support

One SNA function, which outboard TN3270 servers were able to automatically leverage, due to their dependent LU model, was VTAM's autologon support. The S/390 TN3270 server supported DEFAULTAPPL, which allowed the client to automatically logon to the SNA application at the time of connection with the TN3270 server. However, if the SNA application was not available at the time of the logon request the session failed and the client was disconnected. This impacted overall application availability and made even planned outages of the SNA application very disruptive to the clients. Full autologon support has been added to the S/390 TN3270 server in V2R10 to ensure that customers dependent on VTAM's autologon function can migrate to the S/390 TN3270 server without loss of functionality. In addition, the S/390 TN3270 server allows the customer to specify whether reallocation of the autologon session should only be done on session setup failures and abnormal session outages. This addresses the common problem with the traditional VTAM autologon support in which the session is reallocated even though the LU (client) has issued a logoff. This occurs when the controlling SNA application successfully passes (i.e. CLSDST PASS) its session with the LU (client) to another SNA application. This is commonly done by session managers (e.g. TSO/VTAM).

Fast Reconnect Enhancement

One of the more common availability problems in a TN3270E environment is that loss of the TCP/IP connection between the TN3270E client and the TN3270E server also results in a loss of the SNA session between the TN3270E server and the SNA primary application. This loss of the SNA session results in the following negative impacts to the customers' networks:

- Increased use of network resources - all SNA nodes along the session path have to

clean up and then reestablish the lost SNA session

- Confusion for network operators and network automation due to the SNA session failure messages associated with the tearing down (clean up) of the SNA session
- Loss of availability due to the network delay in having to tear down and then reestablish the SNA session before the client can begin normal operations

The Fast Reconnect support in V2R8 has been enhanced in V2R10 to preserve the SNA session across the reconnect of the TN3270E client. Once the reconnect has been accomplished, there is a re-sync of the TN3270E client and the SNA primary application allowing normal operation of the session to continue. Since the client retains no knowledge of the SNA session across the reconnect, the TN3270E server and the SNA primary application must supply the session information needed by the TN3270E client to avoid a "bounce" of the SNA session. Although the TN3270E server simply passes session data between the SNA primary application and the TN3270E client and has no way of knowing the last SNA session data successfully sent, several SNA primary applications (e.g. TSO/VTAM) maintain the last 3270 data screen sent to the TN3270E client. The TN3270E server therefore requests a screen refresh by sending LUSTAT to the primary SNA application. Note that even for SNA primary applications that do not support full reconnect (i.e. last screen refreshed), sending the LUSTAT still results in superior network availability. These applications will simply re-prompt the TN3270E client to re-logon via the application logon screen avoiding the tearing down and rebuilding of the SNA session from a network perspective (i.e. even though the client must re-logon to the application, the network still sees this as non-disruptive).

Resource Pooling

An increasingly common TN3270E client function is to request that the TN3270E server

assign the client's SNA LU name from a specific pool of LUs. This eases the administrative burden on the system administrator while ensuring that naming conventions for unique client groups (e.g. clients from a particular department like payroll) are maintained. This support is documented in RFC 2233 and is fully implemented by the S/390 TN3270E server in V2R10.

TN3270 Visibility

Many network and application management functions provided by a SNA network are based on the SNA LU name of the 3270 device. In a TN3270 environment, this can cause management problems since the TN3270 server could have been assigned the SNA LU name from a pool of LU names. V2R10 expands the visibility of the IP characteristics of the TN3270 client by including the IP characteristics in the session information that is passed along the SNA session path via the following SNA interfaces:

- Control vector on the CINIT RU
- Parameter list of the session management exit (SME)
- Interface with Network Performance Monitor (NPM)
- Interface with Tivoli

The SNA application can use this information for customization, accounting, and problem diagnosis. For example, SNA session managers can use the IP characteristics to customize the menu screens to provide different accounting for Internet vs. intranet TN3270 clients. SNA applications can also include the IP characteristics in error messages and displays associated with the TN3270 client such that problems in session setup can be quickly diagnosed. The Session Management Exit can use the information to provide session level authorization and accounting for sessions involving TN3270 clients. The Network Performance Monitor can use the information to correlate the SNA session performance with the IP connection performance so that a true end-to-end measurement of TN3270 response time can be provided for each client. NetView

for OS/390 displays the number of active TN3270 client sessions for a specified TN3270 server and provides both the client IP address and the associated TN3270 server SLU name and application PLU name. It allows the operator to identify "hung" connections and drop those connections.

Usability Enhancements

V2R10's TN3270 server has also implemented several usability enhancements that ease operation in some environments.

A new debug option can be specified in the TN3270 profile to assist in diagnosing problems with a connection to a specific client or clients. Each stage of the connection is traced by a series of messages written to the console to pinpoint the cause of the connection failure and is only intended for diagnostic purposes and not for normal operation.

Network qualified names for the SNA application can now be specified on the DEFAULTAPPL and LINEMODEAPPL keywords and the line-mode and solicitor panels. This allows for more efficient searching by VTAM and ensures that the proper application is used if multiple applications by this resource name exist in different networks.

A new KEEPOPEN keyword can now be specified in the TN3270 profile for a particular client to ensure that the VTAM ACB used to represent the client to VTAM is allowed to remain open and available even though a logon request by the client has failed. This allows any SNA primary application to successfully initiate a session with the client (e.g. OPNDST ACQUIRE).

Summary

Being inboard, the OS/390 TN3270 server is both a SNA and a TCP/IP application and benefits from both VTAM and TCP/IP management, availability, and scalability enhancements. Customers evaluating TN3270 server options need to fully understand the merits and limitations of both server types.



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