Centralizing Microsoft Servers Hurts Performance

Net Forecasts – Peter J. Sevcik
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Economic and regulatory forces are propelling servers from distributed locations to central data centers to be shared by far-flung users. For all the attendant business benefits, server centralization has one big snag--it hurts the performance of networked applications.

Among the applications most likely to suffer from server centralization are Word, PowerPoint, and Excel, which use Microsoft's Common Internet File System (CIFS) file sharing protocol, and Outlook which uses Microsoft's Messaging Application Programming Interface (MAPI) email protocol. Performance of CIFS and MAPI-based applications degrades markedly as distance to users increases.

We recently set out to document precisely why CIFS and MAPI are uniquely vulnerable to distance, and we measured the effect on the user's experience. (More details are available in NetForecast Report 5081, which is available for free at www.netforecast.com under Reports.) This column explains the problem, and a subsequent column will assess the current crop of solutions designed to fix the problem.

The Server Centralization Trend And Its Unintended Consequence

Cost savings and conformance with regulations like the Sarbanes-Oxley Act are fueling server centralization. Centralizing servers is a boon to the bottom line because it cuts server-related hardware, software, management and equipment space costs--while bolstering security, simplifying data replication, improving business productivity through information sharing, and enabling tighter control and more efficient use of corporate assets. Server centralization also helps businesses secure and manage information to meet increasingly strict regulatory requirements.

Despite its many business benefits, server centralization inevitably stretches the distance between users and servers, which can degrade performance to the point that it affects users' productivity--and attitudes. Absent pre-emptive measures, centralizing Microsoft servers inevitably leads to unpleasant consequences for users and consequently for corporate IT departments--it can even cause server centralization initiatives to fail. For this reason, IT departments need to understand the performance challenges posed by centralizing CIFS and MAPI-based applications, and how to make the applications to behave.

As if server centralization weren't challenging enough--with the separation it imposes between servers and users--another business trend, workforce globalization, is further stretching distances between users and servers. Distributed offices, mobile workers, partners, and outsourcing contractors all must access centralized servers over ever-longer network spans.

Distance hurts performance because it extends the round-trip time between the user and the application server. This added latency may slip by unnoticed with applications that employ few client-server software interactions (or turns), but for applications requiring many interactions, users cannot help but notice the additional time. This is a particular challenge with applications based on the notoriously "chatty" application protocols CIFS and MAPI.

Why CIFS and MAPI Behave Badly

CIFS and MAPI were designed to traverse local area networks, where the performance price for application protocol "chattiness" is slight. Unfortunately, when these applications run over a WAN, the price of such chattiness is serious.

CIFS is sluggish over a WAN because when a client requests a server to open, close, or read a file, rather than send the entire file, CIFS segments it into blocks and transmits the blocks sequentially. For example, if a client requests a 1MB file from a remote server, CIFS breaks the file into hundreds of data blocks and sends the blocks singly. The client acknowledges receipt of each block, and only after receiving the acknowledgement does the server release the next block. This talkativeness adds unwanted seconds, even minutes to the simple task of opening the file. Microsoft's MAPI protocol exhibits similar misbehavior over a WAN.

To place CIFS and MAPI-based application behavior into perspective, it is helpful to compare application profiles for CIFS and MAPI tasks with those of other common application tasks. Figure 1 shows application turns and payload per task on logarithmic scales. As you can see, the number of turns required for CIFS and MAPI-based applications is orders of magnitude larger than for client-server, SNA and even most Web-based applications.

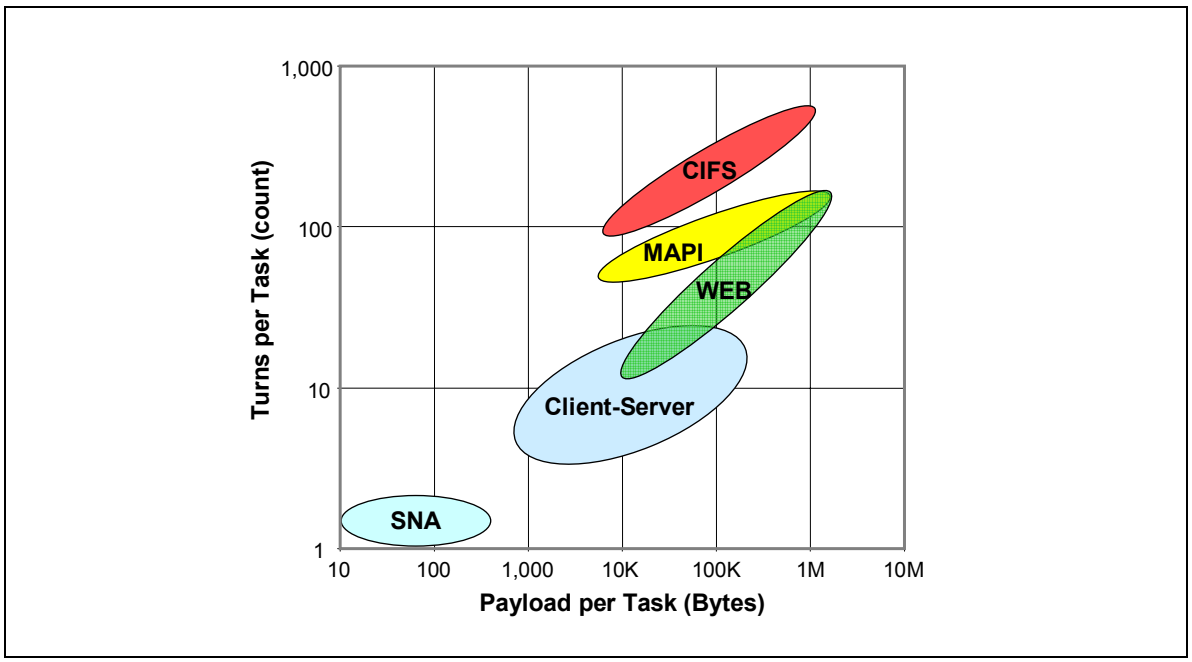

Figure 1 – Comparing Application Profiles

The profiles in Figure 1 are based on actual, not theoretical, measurements of typical user tasks. The CIFS profile summarizes turn count and payload results from accessing PowerPoint files ranging from 10 KB to 1 MB on a Microsoft network file server. The MAPI profile shows results from loading email plus attachments (in the 10-KB to 1-MB range) from a Microsoft Exchange server.

It is interesting to note how the payload size and number of turns required to refresh a user's screen jumped dramatically when enterprises migrated from SNA to client-server, and then to Web and Microsoft-based network applications. It implies that each generation of software platform expects the computer to be closer to the user.

Using Apdex To Document Performance

It is unhelpful to compare raw response time values for each application because task definitions and judgments about acceptable task completion times vary widely for each application type (e.g., a painfully slow task time for one application task type might be entirely acceptable or even excellent for another). Therefore, to equalize the view of performance across applications, we applied an application performance index methodology developed by the Apdex Alliance as an industry standard for measuring and assessing user satisfaction with application performance (see BCR, March 2005, pp.8-10).

The Apdex model in Figure 2 shows the effect of distance on the performance of representative tasks, and it shows at what distance from the application server performance falls from the excellent (blue), to the good (green), the fair (yellow), and finally the poor (red) performance zones. Although the Apdex scale continues to zero, values below 0.5 are considered

unacceptable by the Apdex Alliance and are therefore not shown.

Legacy SNA applications are highly repetitive and designed for short query responses. IBM SNA users typically require a target time of 1 second to remain productive, so we assigned SNA traffic an Apdex target of 1 second (Apdex T=1). In contrast, the Web typically provides rich information that the user digests more slowly, so business-to-business website performance is often satisfactory with a target time of 6 seconds.

Microsoft CIFS manages interactions with shared files on a server. Because users usually don't need to load a file frequently, they will tolerate a longer task time, therefore we gave CIFS a target time of 12 seconds.

Microsoft MAPI is used to access email, and for analysis purposes we assumed each email has a modest-sized attachment that the user will view. This type of interaction provides satisfactory results if an email plus its attachment is retrieved within 9 seconds.

In the Figure 2 scenario, users are accessing a server located in a New York City datacenter. Because they are near the server, New York-based users experience excellent performance for all application types modeled. Users at different distances from the New York server experience remarkably different results depending on the application, with CIFS and MAPI-based applications showing the most precipitous distance-related performance drop.

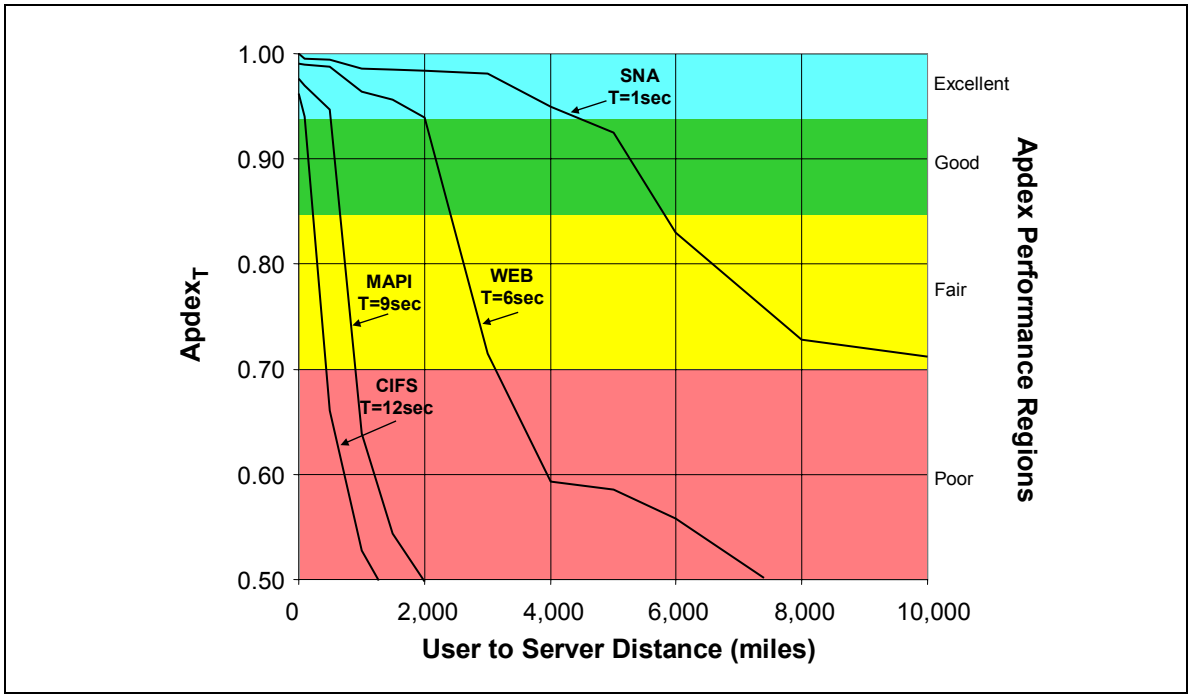

Figure 2 – Performance Falls with Distance

Performance Results

Apdex performance for all of the applications remains excellent (in the blue zone) within a 100-or-so-mile radius from the New York datacenter. SNA, with a target T of 1 second, still provides fair performance as far away from New York as 10,000 miles (a distance equivalent to Melbourne, Australia). No wonder the airline industry still relies on SNA to support agents world wide! Remember this chart next time you stand at a crowded ticket counter on the other side of the world waiting for an agent to change your itinerary, or even assign you another seat. Thank your lucky stars that the airline hasn't switched to an all-Microsoft platform.

Web applications typically fall into the good to fair range within a large region like North America or Europe; however, their performance degrades to poor as traffic traverses oceans to reach the server. Web applications become unacceptable at about 7,000 miles. Bear in mind that this Web model is based on typical business-to-business applications, and media-rich websites will not perform as well.

Microsoft CIFS and MAPI performance drops dramatically with even small distance increases from the server. The Apdex curves for both CIFS and MAPI (even with generous T values of 12 and 9 seconds respectively) plummet into the poor zone within several hundred miles of the server. With servers centralized in New York, performance for both application types would be poor for users in Chicago and completely unacceptable for users on the West Coast of the U.S.

Figure 2 drives home the dramatic and inescapable consequences of CIFS' and MAPI's high turn counts. Without a "fix," users simply cannot be rescued from lousy performance. To match the performance of the Web Apdex curve (which dives for non-U.S. users), CIFS' target time would need to relax to 30 seconds, which would push the frustrated zone to two minutes! Not a promising business move.

Long Response Times Are Bad for Business

Long task response times are bad for business. Long response times that hurt the user experience can hamper productivity, annoy or drive away customers and partners, overwhelm help desks with complaints, to say nothing of eroding the business benefits of server centralization and workforce globalization.

The adverse consequences that long task response times have on business can be subtle. For example, employees may deal with poor performance by hoping that performance will improve later so they defer work, which can slow or even paralyze a project, and hurt competitiveness, cost and efficiency.

What Happens if You Do Nothing

No doubt you have a collection of critical applications that operate on performance/distance curves like those in Figure 2. Be assured that centralizing servers for those applications will force performance down the curves. If you are also migrating to Microsoft's file sharing architecture, you are about to subject your users to a "worst case" set of performance curves, and without corrective steps, stretching user-server distance for CIFS- and/or MAPI-based applications can be disastrous.

Contrary to conventional wisdom, the disaster predicted by the Microsoft server centralization curves in Figure 2 cannot be avoided by adding bandwidth or faster servers, because you cannot escape the physics of latency. Fortunately, however, there are solutions to the problem. A number of techniques can be brought to bear on CIFS and MAPI traffic to fix poor performance without fixing--or even touching--the Microsoft applications themselves. The aim of these techniques is to improve aspects of the applications' behavior over a WAN to lower user task response times. Stay tuned for details about this in a subsequent column.

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More detailed information on this topic is available at the NetForecast web site.

Go to www.netforecastcom and then under the “Reports” tab are the following relevant documents:

Why Centralizing Microsoft Servers Hurts Performance – NFR5081 March 2006
A more detailed version of the information in this article
Why SAP Performance Needs Help – NFR5084 July 2006
A similar analysis of the SAP application platform

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