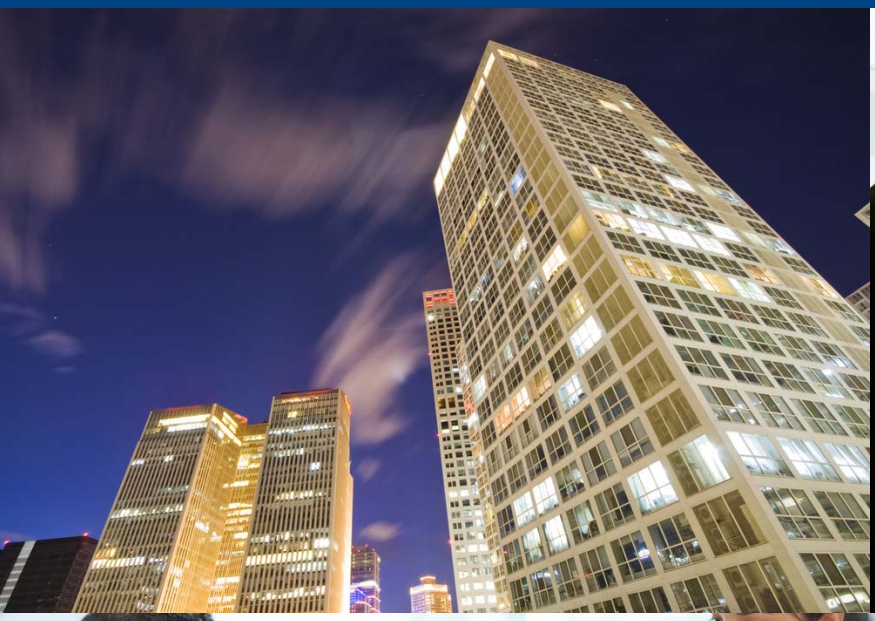
binary testing

Sangfor WANACC M5500 WAN Optimisation Appliance

An evaluation and full performance test of Sangfor's latest mid-range WAN optimisation appliance



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A dilemma facing all businesses today and in the future is that as their WAN links get faster the amount of data they are expected to handle will inevitably increase. Consequently, throwing more bandwidth at underperforming WAN links will be a short term, and prohibitively expensive, solution.

WAN optimisation is rapidly gaining momentum as the most cost-effective alternative to this problem. Established in 2000, Sangfor Technologies offers a broad range of cost-effective WAN optimisation products covering the SMB, mid-range and enterprise markets.

This report delivers a full evaluation and analysis of Sangfor's WANACC M5500 appliances and its PACC mobile client software. It provides an in-depth briefing on Sangfor's optimisation technologies and features and runs full performance tests in the Binary Testing labs.

Applications requiring remote access to the corporate network are constantly evolving resulting in rapidly increasing demands for ever faster connections. To improve responses many businesses think upgrading their WAN links is all that's required and fail to take into account latency, or the round-trip time, which is often at the heart of the problem.

Businesses must address the growing needs of mobile workers, remote offices and emerging cloud services to remain competitive. Typically, these users are expected to work with poorly performing WAN links resulting in a low overall experience which equates to an ongoing loss of productivity. It also causes an increase in the number of complaints to IT support departments resulting in further cost considerations.

In an effort to deal with this, some businesses have attempted to implement distributed data services with the aim of moving their data and applications closer to users. Whilst solving some performance issues these actually create more problems by being extremely costly to implement and difficult to manage.

Optimising WAN links makes far more sense as this technology allows businesses to do much more with their current network infrastructure and WAN resources. Making better use of existing WAN bandwidth obviates the need for expensive line and IT equipment upgrades.

WAN optimisation can greatly improve a user's experience and their productivity. Instead of waiting hours to retrieve files and documents they can be made available in seconds. Application responses will also be significantly faster allowing users to make far better use of their working day.

Remote offices requiring always-on access to the corporate network can benefit from greatly improved responses. This also increases productivity and allows a richer set of applications and services to be delivered to these sites.

Appliance-based products are ideally suited to optimising WAN links between physical locations. These can range from connecting data centres together, remote sites to the data centre, branch office site-to-site links and small remote offices with only a few employees.

Mobile workers that have no fixed location also need to be considered as an appliance is clearly impractical in this scenario. Sangfor offers a low cost software client that is loaded on users' laptops to provide local WAN optimisation services with a selected appliance at the main office.

Executive Summary

Organisations with remote or branch offices and a mobile workforce can no longer expect them to access corporate applications and IT services over prohibitively slow WAN links. There are few benefits to be gained from costly line speed upgrades which will be short-lived as business applications will inevitably grow rapidly to soak up any extra bandwidth.

WAN optimisation, also called WAN acceleration, is a far more effective solution as it can deliver significant performance benefits using existing infrastructures. Sangfor Technologies offers an extensive range of optimisation products and this report evaluates its WANACC M5500 appliance for mid-sized businesses.

A dedicated network in the Binary Testing labs was used to simulate a head office, remote office and mobile workforce environment. The M5500 was introduced to this test network and engineers evaluated installation, deployment plus features and ran full performance tests to determine its effectiveness as a WAN acceleration solution.

After extensive testing, this report concludes that the WANACC appliances fulfil the requirements for swift deployment. The M5500 can be installed easily and we had the head office and remote office networks linked together over an optimised WAN link in minutes.

The appliance offers a rich feature set of optimisation technologies which competes strongly with many other solutions. We were impressed by the fact that it is designed to optimise virtually all WAN traffic out of the box but can be easily customised for specific usage scenarios with user defined optimisation, bandwidth management and quality of service policies.

Operation	Performance Increase
File copy	8-31x
Email	57-76x
FTP	22-64x
Remote file open	7-10x
Remote file save	4-5x
Remote Desktop	3x

Mobile workforces are also well catered for by Sangfor's PACC (Portable ACCelerator) software client. We found this very easy to deploy and capable of delivering excellent performance improvements. It is also made all the more valuable as it works directly with any Sangfor appliance and so requires no further investment in extra hardware.

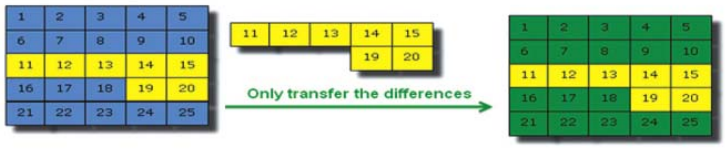
Using a set of files selected by Binary Testing, the test results showed the appliance performed extremely well across a range of tasks. The table alongside shows the performance improvements that were seen in the lab with the email test realising impressive speed boosts of up to 76 times.

This report concludes that the Sangfor WANACC appliances deliver the features and WAN acceleration performance that today's global businesses demand. They are very simple to deploy and cost significantly less than competing products in this sector. Sangfor Technologies is a force to be reckoned with in today's rapidly expanding WAN optimisation market.

What is WAN optimisation?

As business IT infrastructures grow, cost efficiencies demand a move away from a distributed environment and the inevitable 'server-sprawl' this approach generates. Centralising IT services has many benefits including greater security, reduced support costs and easier management.

A drawback of centralisation is that remote workers, branches and offices are now accessing applications and services at the central site over low performance WAN links. The vast majority of business applications were never designed to run over these low-speed links resulting in a huge drop in performance.



WAN optimisation appliances are designed to accelerate these applications using a wide variety of technologies. At its foundation, the technology removes the need to transfer redundant data over WAN links. Appliances are placed on each side of the WAN connection where they examine the data being passed over the link and cache it in local stores.

As more data is transferred, the appliances examine it to see if duplicate data is already stored in their caches. If, for example, a remote user opens a document already cached, the file will be retrieved from the local appliance so delivering LAN-like response times.

If they make a modification to the file and save it, only the changes will be sent to the head office appliance so drastically reducing the amount of traffic being passed over the WAN link. In the majority of cases, this technique can reduce the amount of data being sent by up to 90 per cent.

Data compression is also used to reduce traffic although benefits will be dependent on the types of files being handled by the appliances. Easily compressed files such as documents and spreadsheets can result in compression ratios of up to 5:1 so reducing WAN traffic ever further.

Latency is a major factor in determining network performance and is one of the main reasons why upgrading WAN link speeds often brings no significant benefits. The longer distances and physical limitations of WAN links inevitably introduce delays and these will be exacerbated by protocol overheads and other devices in the path such as routers.

WAN optimisation solutions use a variety of techniques to overcome latency issues. These include TCP acceleration which implements features such as congestion control and dynamically changing the TCP window size to improve WAN performance.

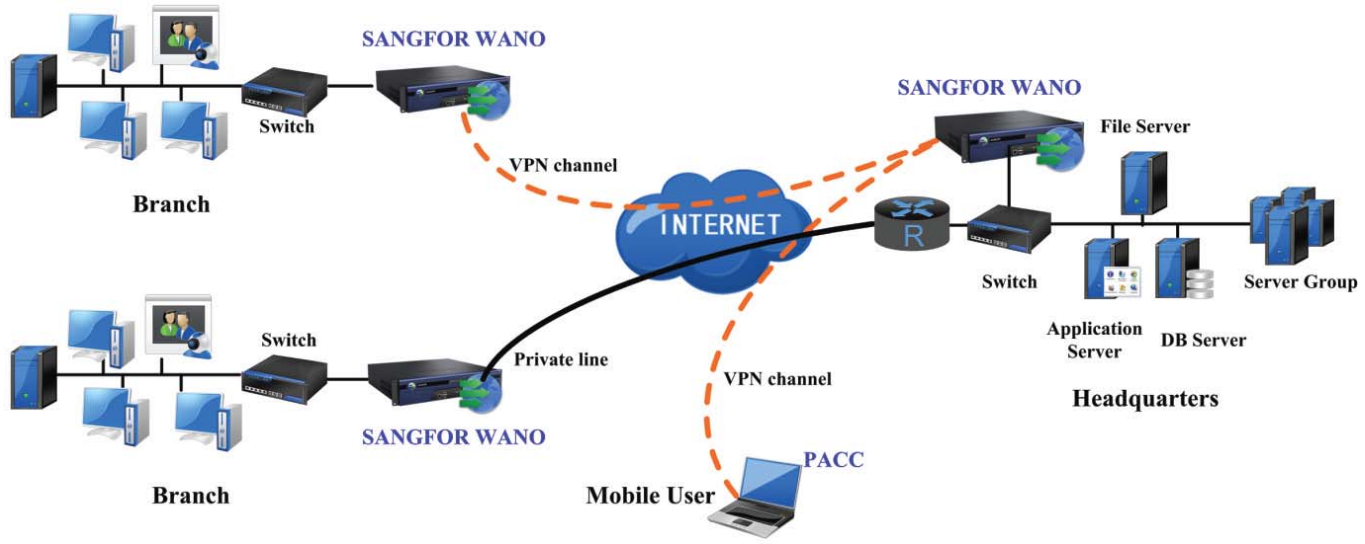
Microsoft's CIFS is a notoriously 'chatty' protocol and this can be accelerated to reduce latency. During file transfers, CIFS sends one block of data at a time and won't send any more until an acknowledgement has been received for the current block.

WAN optimisation appliances can accelerate CIFS traffic by sending acknowledgements from the local appliance for each block as it's sent. This allows more data to be transferred in a given time as the round trip for these acknowledgments has been substantially reduced.

Most WAN optimisation appliances function as TCP proxies but also deliver application-specific proxies as well. Email applications can be a particular problem for WAN links due to their complex request and response mechanisms and the potential for users to send large attachments.

Along with CIFS proxies, many vendors offer proxies for accelerating a wide range of applications. These include proxies for POP3, SMTP, FTP and Microsoft Exchange.

Bandwidth management and QoS (quality of service) are also key contributors to effective WAN optimisation. To avoid problems when WAN links become congested most appliances allow critical applications to be assigned priorities to ensure they are processed before non-essential traffic.



All of Sangfor's WANACC appliances run the same WANO firmware and so offer a standard feature set across the complete family. In common with all solutions currently on the market, they function as transparent TCP proxies that intercept and optimise all TCP traffic.

Byte-caching

In addition, they offer an extensive range of features including bandwidth management, protocol optimisation, compression and byte caching. The latter is implemented using Sangfor's bitstream label-based caching technology which breaks each packet down into smaller fragments and stores them on the appliance on each side of the connection.

When fragment matches are found, the appliance simply transmits a pointer rather than the data. The pointers are used by the recipient appliance to identify bytes held in its own internal data store which are then passed on to the client system. Using this technique, Sangfor claims to be able to reduce WAN traffic by between 30 and 90 per cent.

Compression

Compression is provided as standard and the appliances use this for all traffic to improve WAN performance. Sangfor implements a two-fold approach as it employs both LZO and GZIP technologies. LZO is selected as it provides the best balance between compression and performance. The more common GZIP is the preferred method of compressing web-based resources.

Bandwidth management

For bandwidth management, Sangfor uses deep packet and deep flow inspection. A number of competing solutions simply use IP addresses and ports but these two technologies employ packet inspection allowing Sangfor's appliances to more effectively identify applications.

Sangfor is also able to control UDP and well as TCP traffic more effectively with its per flow queuing and token bucket features. Standard TCP rate control can't handle UDP traffic but Sangfors' technologies allow it to manage TCP and UDP application based traffic but avoid packet loss and network latency prevalent in the more common flow control method.

Application proxies

Along with byte caching and bandwidth management, Sangfor offers an extensive range of application proxies. These include TCP, CIFS, HTTP, HTTPS, FTP, POP3, SMTP and MAPI. Along with the ability to accelerate site-to-site backup operations, Sangfor also provides proxies for popular applications such as Microsoft Exchange, Lotus Notes, SAP, Sharepoint, MS-SQL and Oracle.

Transmission Optimisation

Sangfor offers a number of additional transmission optimisation methods. Its Flash-Link technology is designed specifically for scenarios where high latency and high packet loss is being experienced. Developed by Sangfor, HTP further optimises the TCP protocol by applying selective retransmission controls, congestion control and dynamically optimising the TCP window size.

Security

All Sangfor appliances include an SPI firewall as standard for enhanced site-to-site security. This is a fully featured firewall as it provides packet filtering and URL filtering, NAT, intrusion prevention and protection against DoS attacks.

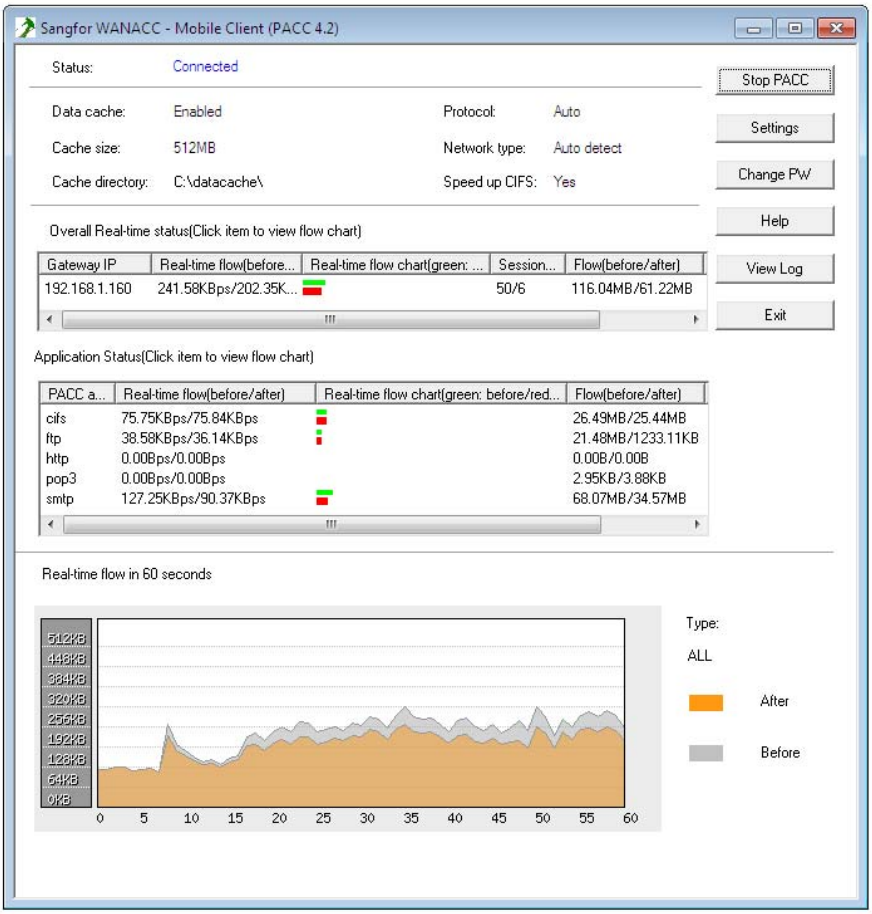
A built-in IPsec VPN module is also provided which implements AES 128-bit encryption algorithms. This allows secure accelerated site-to-site connections to be swiftly created and can also be used to secure access for mobile users.

PACC (Portable ACCelerator)

Another differentiator of the Sangfor solution is its optional Portable Accelerator (PACC) client software which extends WAN optimisation to mobile clients. Key features are its ability to work directly with the WANACC appliances and also Sangfor's concurrent user licensing scheme.

Solutions such as Riverbed's Mobile solution are far more costly to implement as this requires an extra Controller appliance to handle the software client. Furthermore, the Controller cannot function as a standalone unit and only works in tandem with the Steelhead appliances.

For the PACC software, Sangfor only enforces licensing at the appliance to determine the number of concurrent mobile users it will support. This approach makes it easier for businesses to avoid wastage as they can provide the software to all their mobile clients but only purchase licenses as demand dictates.



The M5500 appliance on evaluation represents the mid-point of Sangfor's WANACC appliance family and targets deployments in mid-sized businesses and enterprises. It's a well specified 2U rack appliance with a dual-core CPU, 4GB of RAM and four copper Gigabit Ethernet ports which can be used for LAN, WAN and DMZ duties.

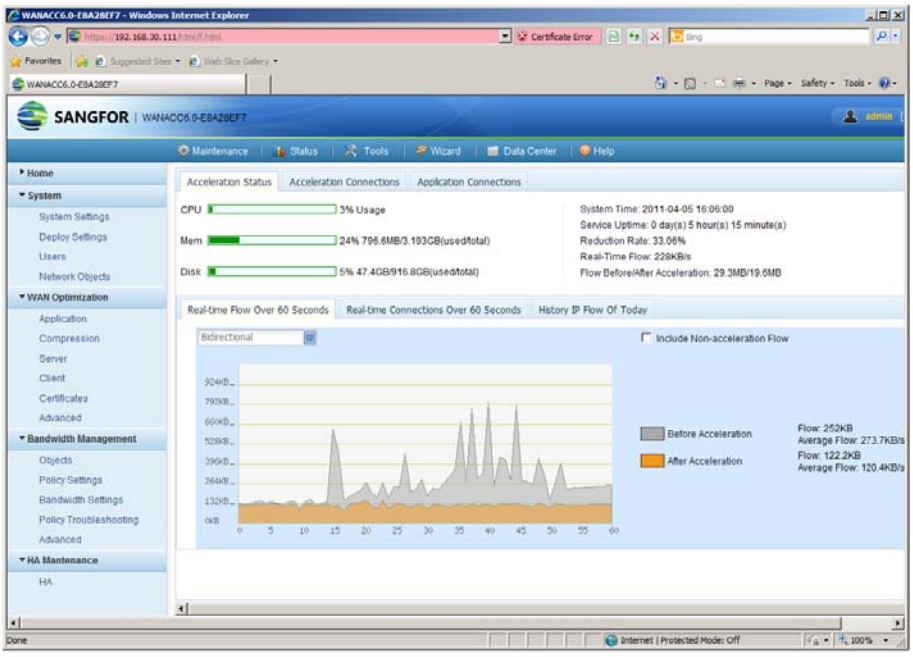
The appliance also offers two SFP ports for long distance fibre Gigabit uplinks. An important feature is the hardware bypass switch implemented between one pair of Gigabit ports. If the appliance fails this immediately creates a physical path between them so you don't lose your Internet connection.

We found deployment in the lab a swift process as there is no need to use a serial port link and the CLI for initial configuration. For the M5500 at our head office we simply pointed a web browser at its default LAN port IP address where we were presented with a very well designed and intuitive interface.

A wizard is provided to help with initial setup and this runs through licensing the appliance and configuring the network ports. You can choose to only accelerate traffic or team this up with automatic VPN creation and the M5500 supports gateway, single arm and bridged modes.

We opted for bridged mode and quickly ran through providing an IP address and gateway details. You then enter the network objects you want traffic to be accelerated for and add users for the gateway and PACC software.

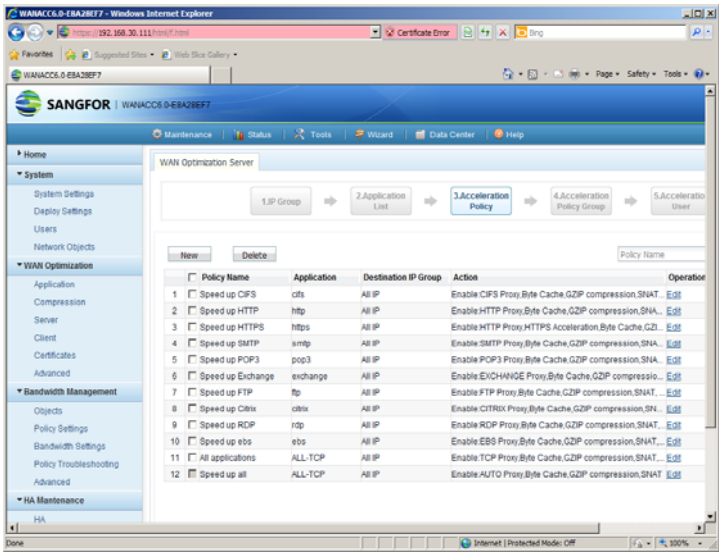
You can add new applications at this stage if you wish but Sangfor has predefined the most popular ones along with their relevant port numbers. The appliance uses acceleration policies to determine how it handles traffic types. Multiple policies can also be placed in groups which are applied to specific users and groups of users.



Predefined policies are already included but you can choose specific protocols and elect to have LZO or GZIP compression algorithms applied. Byte caching can be enabled on a per policy basis, a destination IP address or range and SNAT applied as well.

We found deploying the remote appliance very swift as you just provide it with a client IP address of the appliance at the main site. Once connected it takes all its settings and policies from the main appliance and starts optimising traffic straight away.

We found the web management interface provides easy access to all features. From the System menu in the leftmost panel you can choose the deployment mode and enable optimisation only or team this up with automatic VPN creation.



The System Status page provides bar graphs showing CPU, memory and local storage utilisation for the appliance. Below this is a large graph which can be used to display sixty second real time views of traffic flows or connections. It also offers a historical view of IP flows for the current day with a breakdown of optimised and un-optimised traffic.

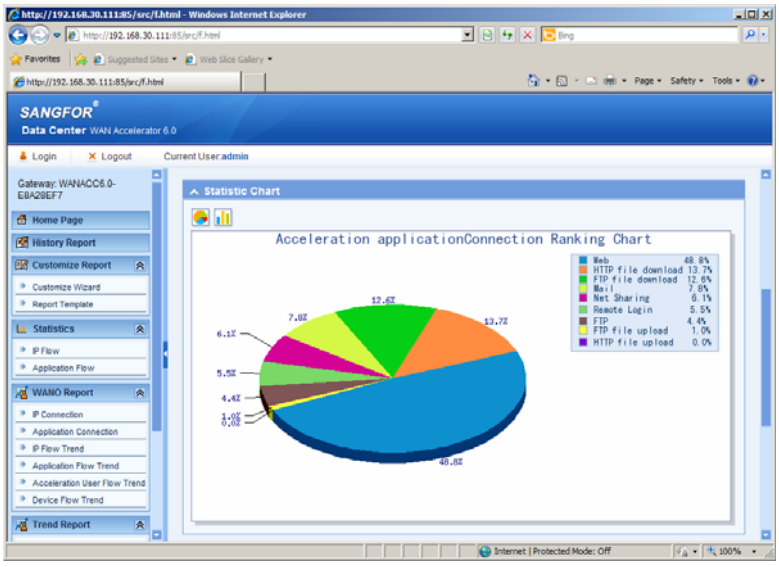
Accelerated connections can be viewed in another list which shows details of each user along with the remote appliance, traffic throughput and a reduction percentage. For this page you can also enable and disable optimisation with a single mouse click, refresh the display and clear the cache.

You can also view charts of application connections where each entry shows the application proxy in use, the local and remote appliances, associated PACC clients and traffic statistics. Usefully, the list can have filters applies so you can fine tune the display to show specific application proxies or appliances.

Network objects are used to define application servers and you can use single IP addresses, groups or subnets. Applications and their associated port numbers are also defined in this section and Sangfor has preconfigured fourteen of the most common allowing it to start optimising traffic on its default settings.

Policies are used to determine which applications should be accelerated and are applied to specific host IP addresses, groups or subnets. They define the application proxies to be used, the compression algorithm and whether the byte cache should be enabled.

Acceleration users are created for each remote gateway allowing them to login securely to the master appliance and retrieve the policies that have been associated with them. PACC users are also defined for each remote worker and can have their own policies applied to determine which applications should be accelerated for them.

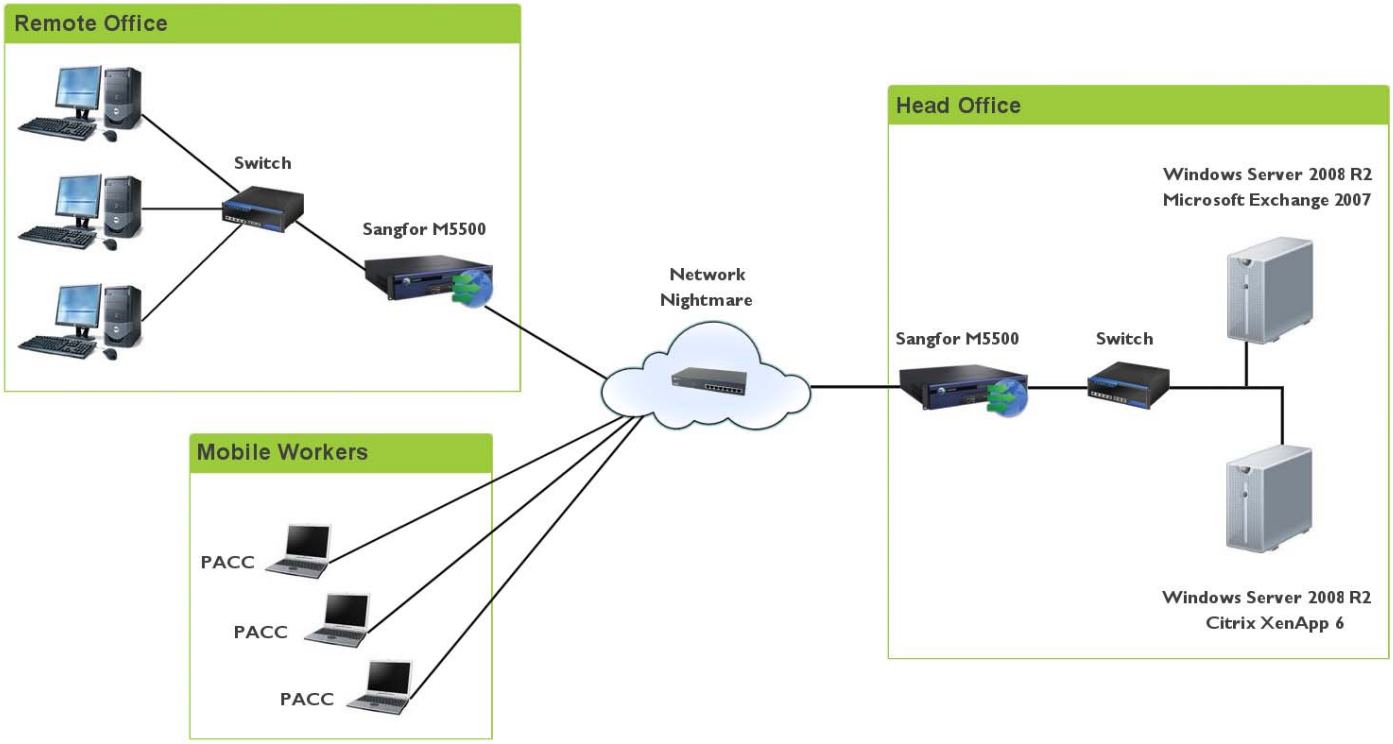


Control policies can be used to allow or deny access to specific applications for selected groups. The appliances can also apply URL filtering policies to user groups to control their browsing habits.

The latest firmware includes Sangfor's Data Center feature which provides extensive reporting facilities. Three main categories are provided allowing you to generate statistical, trending and summary reports.

A great deal of useful information about network traffic, user activity and application usage can be gathered. You can create reports on IP traffic and application flows for selected periods and see trends in activity. Filters can be applied to look at specific IP addresses or applications and the results can be viewed as pie or bar charts and exported directly to PDF format.

Lab Test Environment



For performance testing we created a network in the lab to simulate an environment comprising a head office and remote site. Two WANACC M5500 appliances were used with one placed in front of the head office network and the other at the remote site.

The M5500 appliances were linked to a Network Nightmare WAN simulator (*www.networknightmare.com*) configured in routed mode with a 1Mbps WAN link and a latency of 200ms. At the head office we used two Dell PowerEdge servers running Windows Server 2008 R2 Standard 64-bit. One server was configured with IIS and FTP services plus Microsoft's Exchange Server 2007.

The second server had Microsoft Terminal Services enabled to provide remote application resources to our clients. At the remote site we used client PCs running Windows 7 Professional, Microsoft Office 2010 Professional, the FileZilla FTP client and Windows Live Mail. These systems were also used as mobile clients to test the Sangfor PACC software.

To test WAN optimisation performance we created a set of four test files. To maintain complete transparency for the performance tests, Sangfor had no input into the choice and content of these files. Rather than use files designed to deliver the best performance results, we wanted to see how well the appliances handled those with data representative of real world usage.

To test CIFS/SMB performance we used timed drag and drop copies of each file from the server to the client. The files were emailed from the server to the client using Exchange and OWA (Outlook Web Access) and also uploaded from the server via FTP using FileZilla.

With the test files accessed from a mapped share on the server, we timed how long it took for the client to open each one using the appropriate Office application. A small modification was then made to each one and saved back to the server.

Three test runs were conducted with the first run timed with optimisation disabled on both appliances. The tests were then repeated with optimisation enabled and the files cached in the appliances.

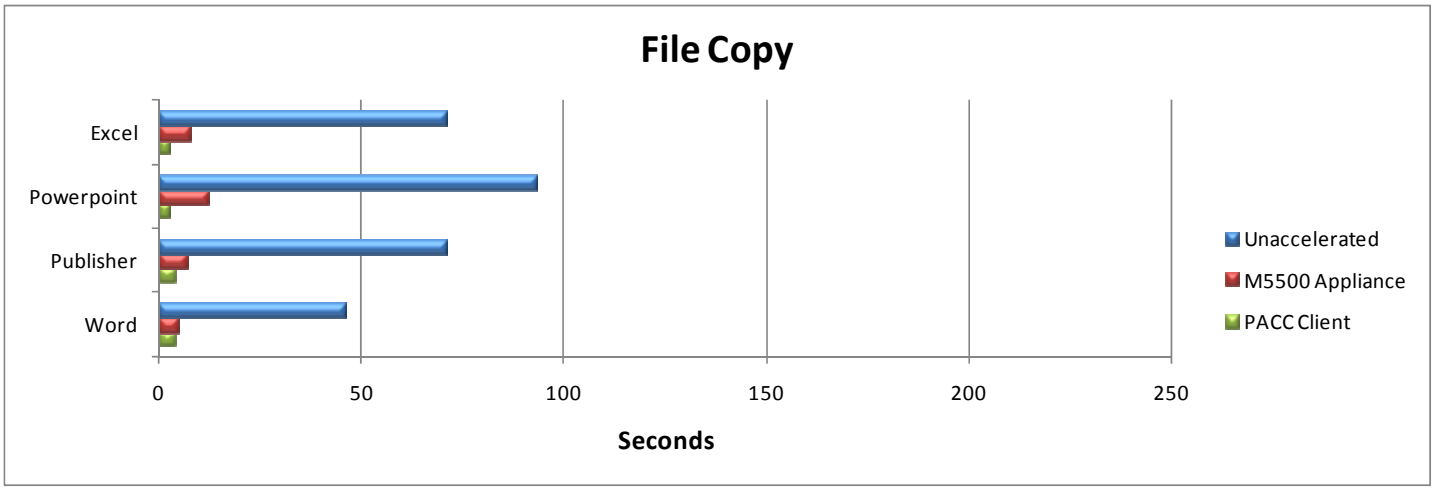
For the third run we removed the remote office appliance from the test network and loaded the PACC software on the remote clients. With the clients connected directly to the WAN simulator we reran the tests for a third time with the files cached locally.

A further set of tests were run to see how well the appliance optimised RDP generated traffic. Two files were used for these tests – the Powerpoint presentation and a 38MB Adobe Acrobat PDF file.

A remote client connected to the server over RDP and accessed each test file remotely. From the client we viewed all 61 pages of the Powerpoint file and the first 200 pages of the PDF.

From the appliance's web interface we could see how much traffic would be generated with no optimisation and the reductions being achieved with it enabled.

Test Files	Size	Pages/Slides/Rows	Content
Word document	5,140 KBytes	95 pages	Text and graphics
Publisher document	8,426 KBytes	10 pages	Text, graphics and photographs
Powerpoint Presentation	10,632 Kbytes	61 slides	Text, graphics and photographs
Excel Spreadsheet	8,338 Kbytes	28,260 rows	Text
PDF Document	38,066 Kbytes	400 pages	Text and graphics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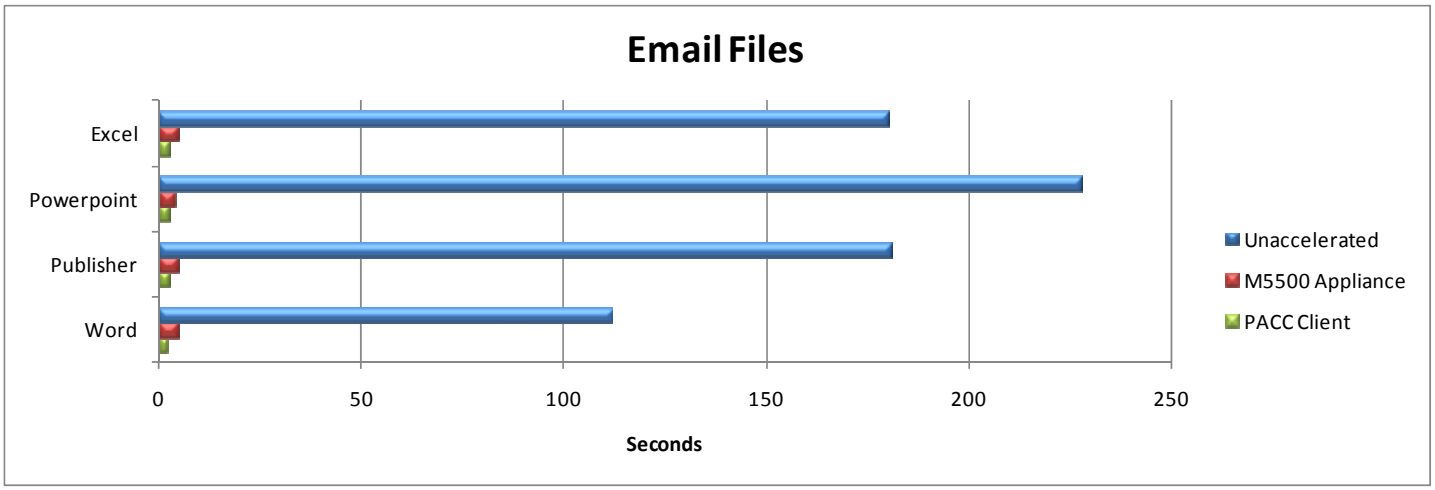
Unaccelerated
M5500 Appliance
PACC Client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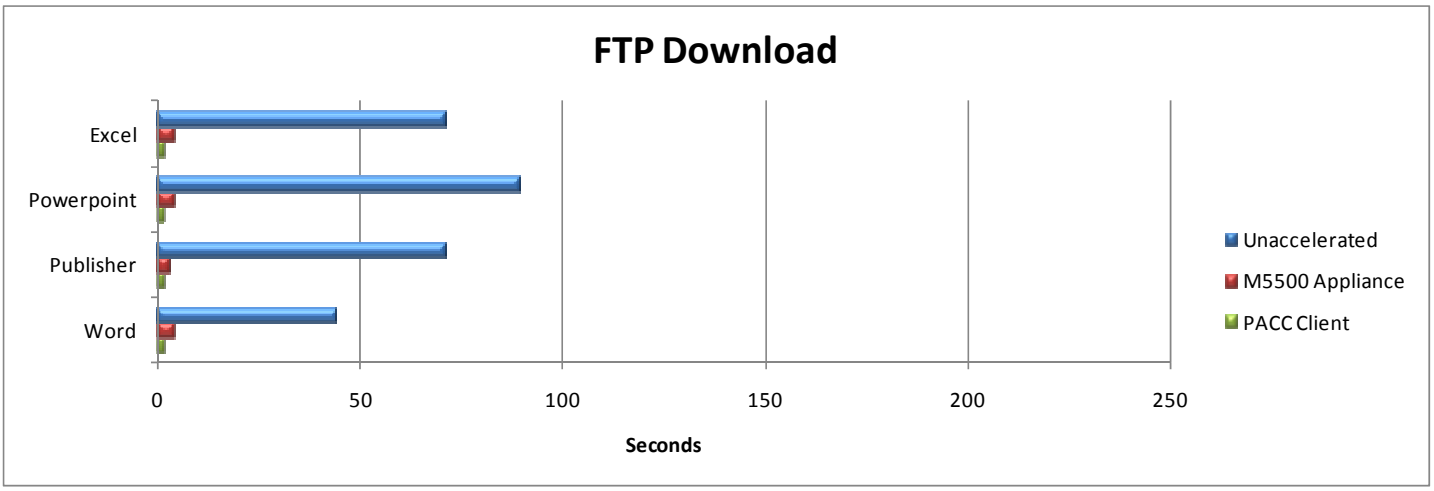
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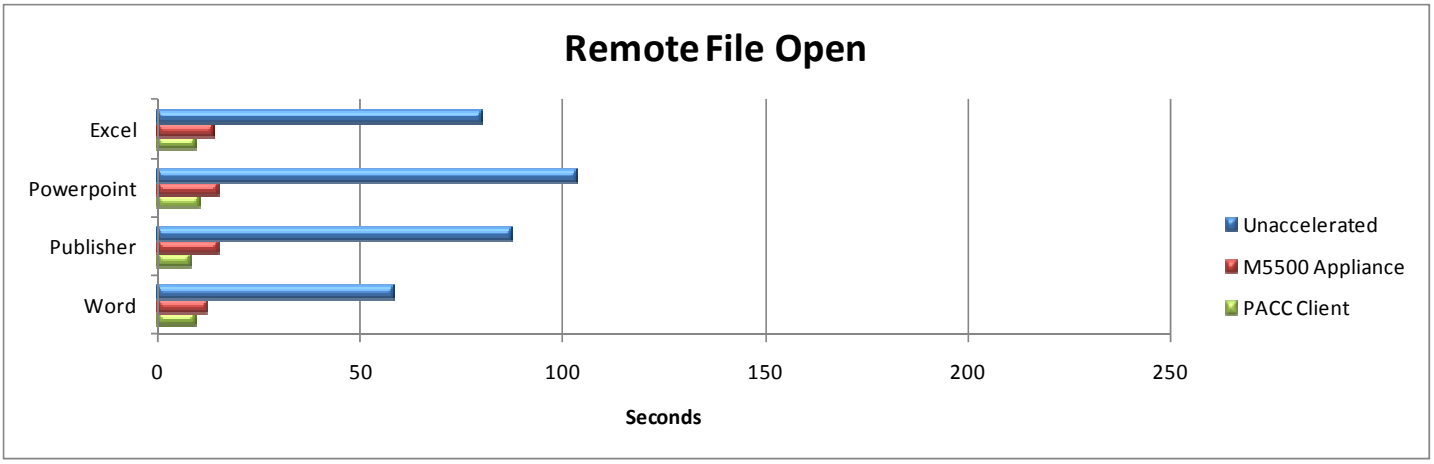
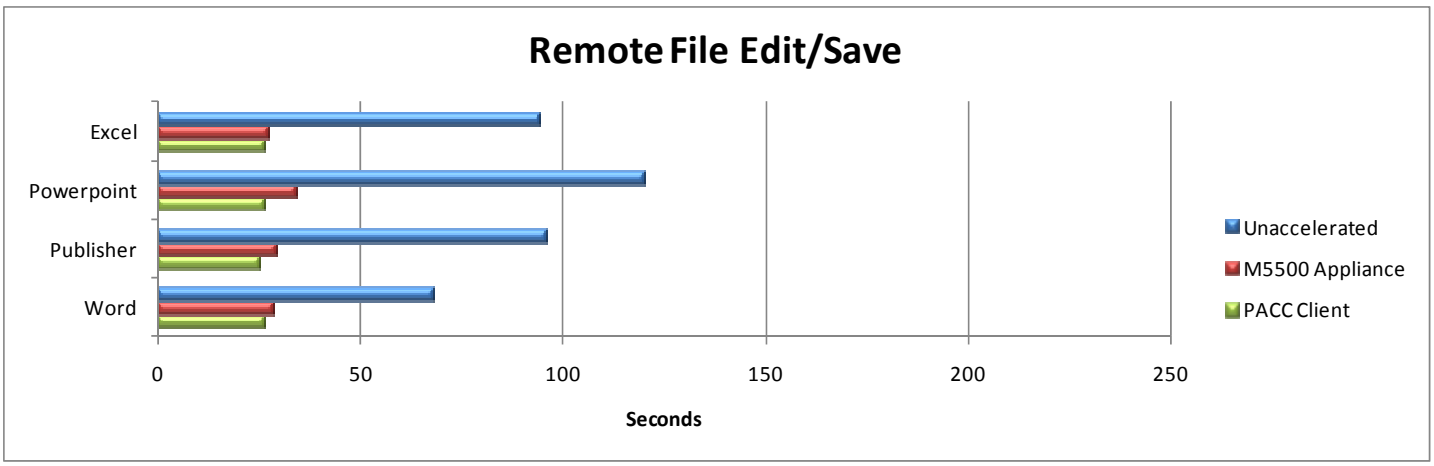
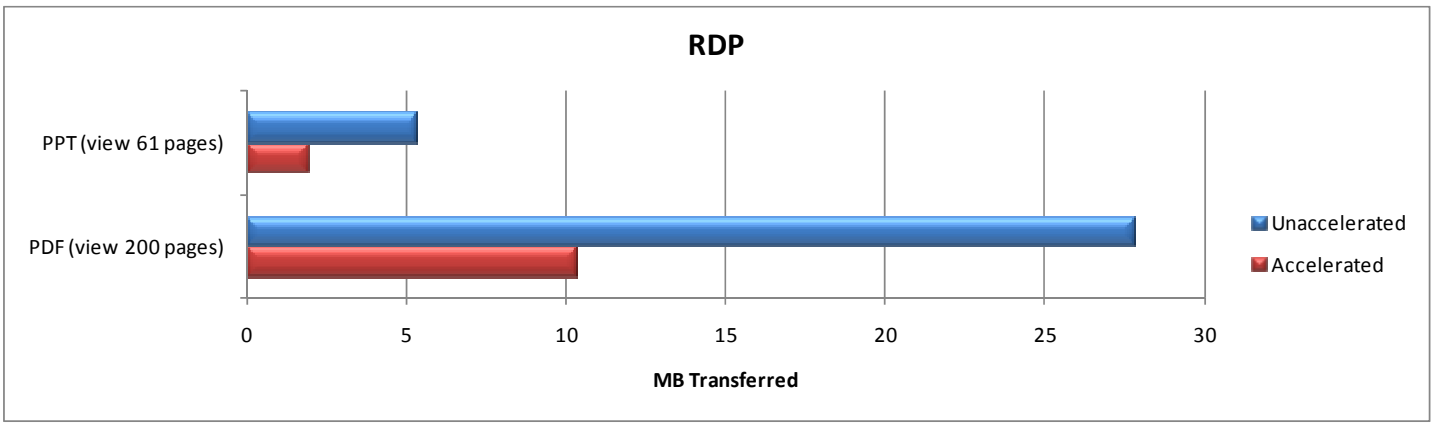
Performance Test Results





RDP Performance Test Results



Conclusion

WAN optimisation offers businesses struggling with choked up WAN connections a far more practical alternative to upgrading line speeds. However, although there is a wide choice of solutions on the market today, costs and features vary considerably making it imperative that businesses make the right buying decision

Sangfor Technologies is a relative newcomer to the UK and EMEA WAN optimisation markets but this report concludes that it stands out from the established vendors with a highly cost-competitive range of products. Furthermore, this isn't at the expense of features as our lab tests show that its WANACC appliances offer an innovative range of WAN optimisation technologies that deliver excellent performance benefits.

During testing we were impressed with the ease of installation and deployment of the M5500 appliances. Sangfor's well designed management interface, wizard based assistance and comprehensive set of default parameters provided on the appliances allows WAN optimisation to begin almost immediately.

The level of features provided is extensive and combining Sangfor's innovative optimisation technologies with its acceleration policies also makes the appliances highly versatile. There appears to be very little traffic it can't handle as Sangfor includes proxies for all popular applications and is also capable of accelerating site-to-site backups, IP SAN traffic and replication operations using products such as Double-Take.

Sangfor's PACC client is another important differentiator as this software extends WAN optimisation and VPN security to mobile workers regardless of their physical location. It's very easy to deploy and, unlike a number of competing mobile optimisation solutions, works directly with the main appliances and doesn't require any additional hardware to be purchased.

Our performance tests show clearly the gains the WANACC appliances can deliver and these speed improvements are in line with all other WAN optimisation solutions tested in the Binary Testing labs. For file copy, email and FTP operations we saw speed improvements for a low bandwidth 1Mbps WAN link ranging from 8 times up to as high as 76 times.

We can confirm that mobile workers will also see huge benefits from Sangfor's PACC software. As this uses a fast local cache on the user's PC or laptop we saw slightly faster times posted than for the remote M5500 appliance with email application responses when sending the larger Powerpoint file improved by 76 times.

Sangfor also stands out for its highly competitive pricing structure. The M5500 appliance on evaluation supports WAN links of 50Mbps and up to 6,000 concurrent TCP connections and has a list price of £13,500. The equivalent Steelhead 2050H appliance from Riverbed supports 45Mbps WAN speeds and 6,000 concurrent TCP connections but costs significantly more.

This competitive pricing also makes Sangfor's products highly suited to SMBs. For example, its entry-level S5000-H appliance offers the same features and support for 6Mbps WAN speeds plus 300 concurrent TCP connections and only costs around £2,000.

This report concludes that Sangfor's WANACC appliances offer a highly cost-effective alternative to the established names in the WAN optimisation industry. They come with an extensive range of optimisation technologies as standard, are extremely easy to deploy and capable of delivering impressive boosts to WAN performance across wide range of applications.

Testing conducted and report compiled by

Binary Testing Ltd Newhaven Enterprise Centre Denton Island Newhaven
BN9 9BA United Kingdom Tel: +44 (0)1273 615270 E info@binarytesting.com

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