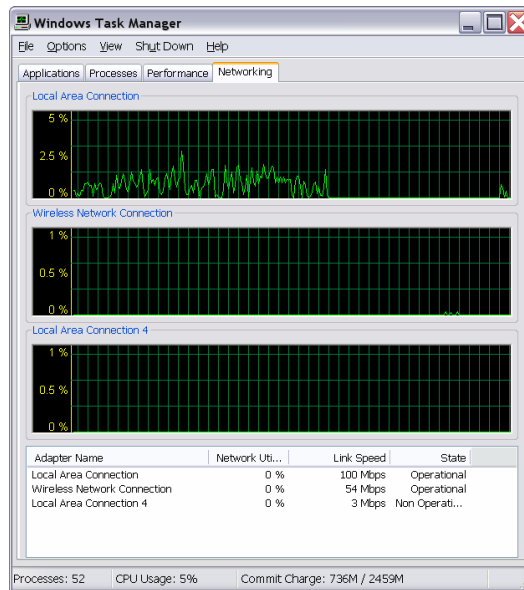




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Vista Online Gaming:

Does Vista's New Network Stack Help Online Gaming Performance?

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Vista Online Gaming Does Vista's New Network Stack Help Online Gaming Performance?

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The short answer is: no. Vista's new network stack does NOT help online gaming at all. The purpose of this white paper is to show how and explain why Vista's new network stack does not improve online gaming.

Network and game performance data was collected using Windows XP and Windows Vista on a variety of systems. The data shown here speaks for itself: Vista Online Gaming performance is worse than Online Gaming in XP. We also looked at the benefits of bypassing the XP Networking Stack (using LLR Technology with a Killer NIC network card) during game-play, and compared the benefits of Stack Bypass in Vista. Yet again, the data showed the Vista network stack is inferior to the XP stack. Bypassing the Vista network stack yields larger benefits in performance than bypassing the XP networking stack. Finally, we looked at the performance of some non-game applications to see how they performed, and discovered that they were equal or better in Vista than in XP: it appears that just online games perform worse in Vista than XP.

Having established firmly that game networking performance is lower in Windows Vista than it is in Windows XP, we then asked 2 questions.

- 1.) Why is Vista worse?
- 2.) Will Vista get better?

The first question, why is Vista worse, required some intense reading and cutting to the chase of white papers and available Microsoft MSDN networking code. Even just looking at Microsoft's own objectives reveals intrinsically why the Vista Networking stack is inferior: in summary, it is bloated and designed for throughput, not latency.

The second question, will Vista get better, is a harder one to answer. For games that take advantage of the new QOS features of the Vista Network stack, the answer may be 'yes'. Unfortunately those types of games will be limited to slower, non-FPS type titles: so the answer is 'no' if you play FPS or 'twitch'-style games.

In conclusion, the answer to is the Vista Network Stack better for online gaming is still pretty simple: no.

Will the new Vista Network stack help online games someday in the future? The answer is it depends on what kinds of games you like to play...

If you like to play games that do not rely on fast-paced, fast-action, and high degrees of interactivity (requiring low latencies) like Battlefield 2142, Call of Duty 3 and even Supreme Commander, the answer is no. Those games will continue to use UDP/IP, receive no benefits of the new Network Stack, and in fact will run SLOWER as a result of Microsoft's renowned feature bloat, such as the wasteful new WDK interface.

Bypassing the Vista network stack yields larger benefits in performance than bypassing the XP network stack.

What is your best solution to the new wasteful Vista stack? A Killer NIC powered by LLR Technology which bypasses all of Microsoft's new bloat.

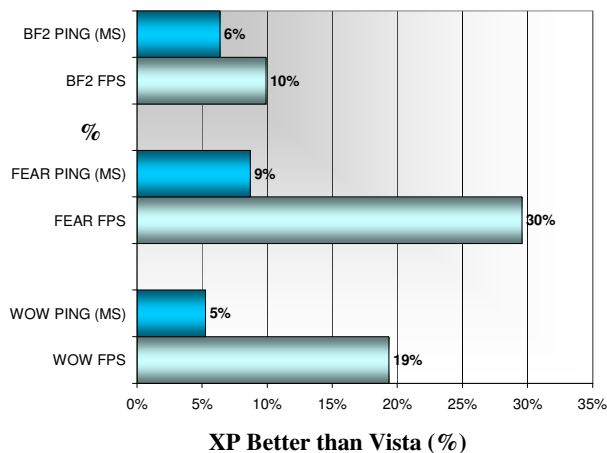
Performance Data Shows XP better than Vista for Online Gaming:

One set of identical computers were used for this testing (e.g. 2 identical computers).

The games tested were:
Blizzard World of Warcraft
Vivendi F.E.A.R.
EA Battlefield 2

System Configurations:
Primary Test Systems A1 and A2:
AMD Athlon 64 X2 5000+
2GB RAM
NVIDIA Geforce 7900GT
Resolution: 1680x1050

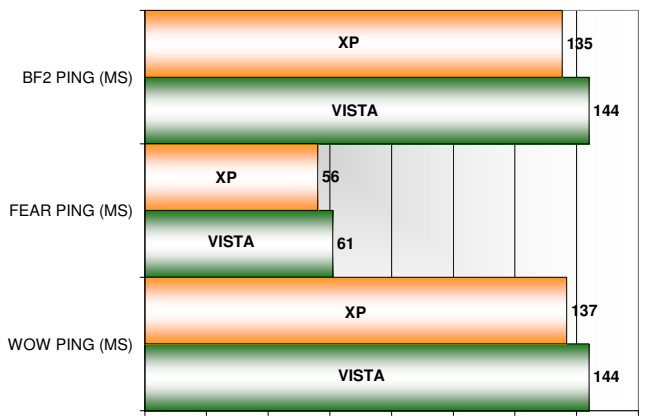
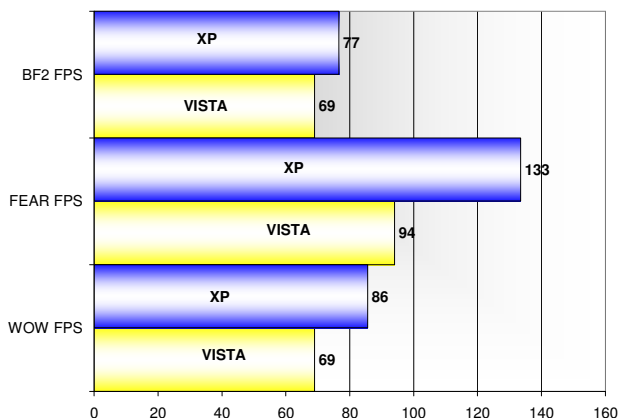
Results:



The above results show that XP has a significant edge in all games, especially FEAR.

As with all the tests done for this white paper, these tests were performed with both systems in the game on the same map, in the same servers, with the same number of players, at the same time. FPS data was captured using the FRAPS performance tool, and ping data was measured using in-game ping tools. Testers were monitored to ensure that during gameplay they followed each other closely and were on the same team.

The XP percent better than Vista graph shown above can also be shown as the absolute measurements which were taken. Each measurement here is an average of 4 test runs:



XP vs. VISTA (FPS, higher=better)

XP vs. VISTA (Ping, higher=worse)

Effect of Bypassing the Windows Stack

One of the Killer NIC’s primary features is its ability to bypass the Windows networking stack. The Killer was designed to do this for a lot of reasons, one big one being that the Windows Networking stack is not always the most efficient. This is especially true with certain “winsock” function calls [such as WSA_Select]. The efficiency problem is also due to the bloat mentioned later, such as bloat caused by adding Filter Driver support, etc.

Since the Killer NIC bypasses the stack, the relative performance benefits of bypassing the stack in an XP system versus the same system running Vista is another great way of assessing the performance impact Vista vs. XP. If Vista’s stack was superior to XP’s for online gaming, then theoretically we should see less improvement on Vista than XP by bypassing the network stack with the Killer NIC.

System Configurations:

Primary Test Systems A1 and A2:

AMD Athlon 64 X2 5000+

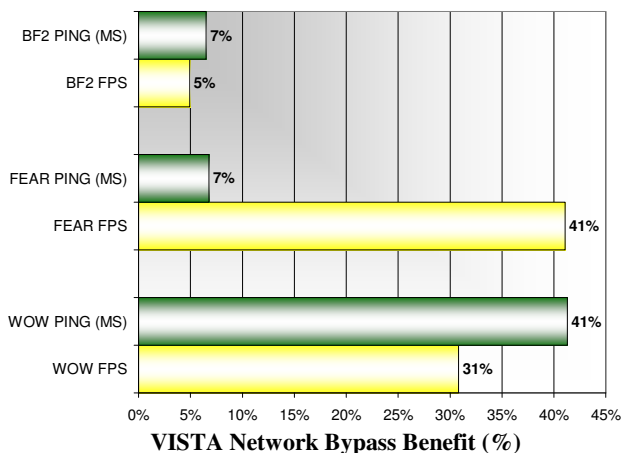
2GB RAM

NVIDIA Geforce 7900GT

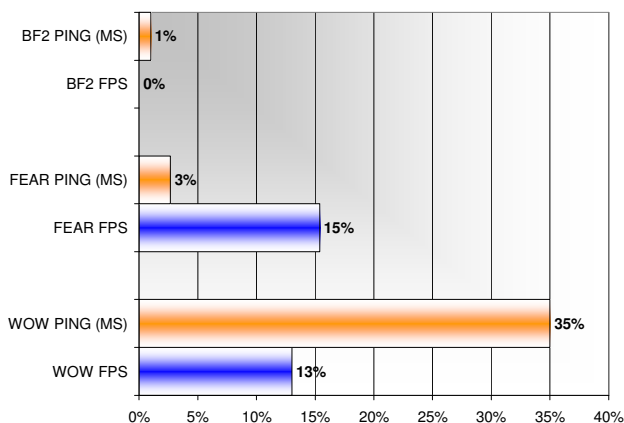
Killer NIC M1 (A2 system only)

Resolution: 1680x1050

Results:



VISTA Network Bypass Benefit (%)

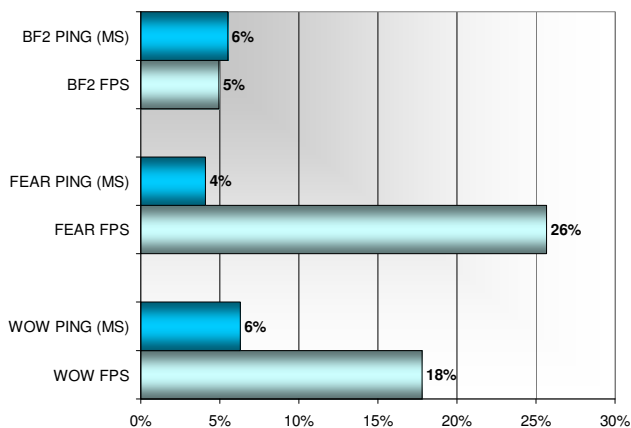


XP Network Bypass Benefit (%)

As you can see the benefits of the Killer NIC in Windows Vista are much higher in all cases than the benefits of the Killer NIC in Windows XP.

In short, Killer NIC's bypassing of the XP Network stack helps online gaming performance, but the Killer NIC bypassing the Vista Network stack is even more important! Without bypassing the windows Network stack, FEAR is practically unplayable on VISTA (in this system).

Another way to look at this is to see the % difference in improvement XP vs VISTA, based on the stack bypass method.



% XP better than Vista (bypass method)

Non-Gaming Performance Data

For these tests, the following Windows applications network performance was tested:

Web Throughput Performance
<http://www.speakeasy.net/speedtest>

Legal Torrent Download using BitTorrent Client
<http://www.bittorrent.com>

In both cases above, the performance of Vista's networking stack was between 0-4% improved over XP. In these tests, however, the 'throughput' capabilities of the Vista Network stack (on TCP/IP) was being examined.

Unfortunately, for online gamers, throughput performance is NOT indicative of online gaming performance. In fact, as will be shown in the next section, throughput performance is most often gained by giving up 'latency' (or Ping) performance.

It is worth mentioning here, that performing EITHER of these tests WHILE trying to game yields a very poor performing game in both XP and VISTA.

The exception to this was if the Killer NIC was installed, in which case the game was still playable. This is especially true if Killer NIC's 'hardware offloaded' Torrent downloading client is used.

"Other" Systems Used for Validity of Results

In addition, quick checks across 2 other system configurations were used to validate performance results. Special note: 2GB of RAM was used in 2 of 3 system configurations, because less than 2GB of RAM caused serious performance differences in XP vs. Vista (Vista does not run current online games well with less than 2GB RAM).

Core 2 Extreme QX6700 (Quad-Core Intel Processor)
 2 GB RAM
 NVIDIA 8800-GTX

AMD FX-55
 1GB RAM
 ATI Radeon 1900

Why is Vista Worse?

Online gaming in Vista is worse than online gaming in XP (in terms of performance) for two primary reasons. First, Vista's networking stack has gained a lot of new features, but as a result has gotten "fatter" and more bloated and convoluted than ever. Second, Vista's networking stack does not fix any of the problems inherent in its' interfacing that cause online games to under-perform. In fact, Vista's new networking stack completely ignores improvements to the network protocol of choice: the UDP network stack. Nearly every "enhancement" of the new Vista Stack is focused on TCP/IP throughput improvement, instead of UDP/IP latency improvement (which would help online games).

It is important to note that 'some' of the performance gap in FPS between XP and Vista can be explained by Vista Video Card Drivers. This is another reason in which we compared the benefits of bypassing the networking stack in Vista compared to XP. The ability to do this, allows for the Video Card drivers to hold constant in the A/B comparisons. (as noted above, the performance gap is still there).

Throughput performance is NOT indicative of online gaming performance.

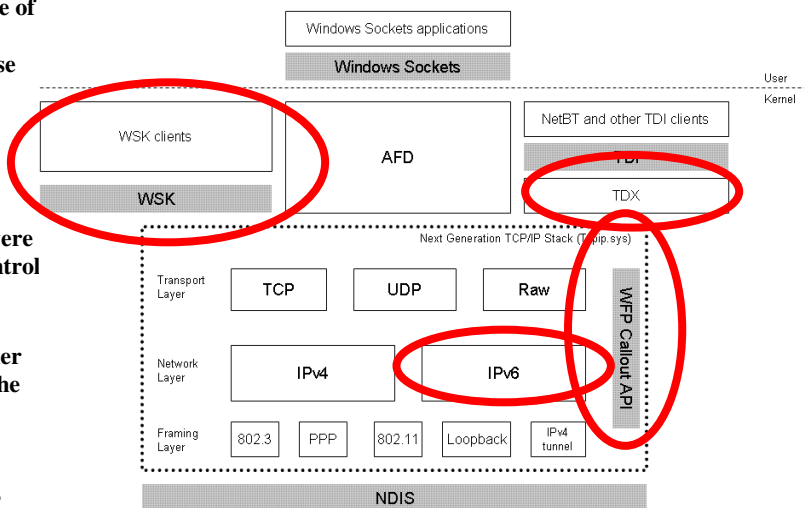
To dive deeper into the answer why Vista is worse we must look at the 'new' Vista features and see which of them would even 'possibly' help online gaming. The big caveat here is that if the game is using TCP/IP (which less than about 20% of online games do), then there may be some benefit in the future.

Here is a non-comprehensive (but as complete as possible) list of new Vista Features, and their impact to online gaming:

- CTCP: CTCP more aggressively increases the send window for connections with large receive window sizes and large bandwidth-delay products. **Irrelevant to games which use much lower-bandwidth than what CTCP might improve. Does nothing for latency issues, except potentially “fill the routers” with more non-gaming data, making it even harder to get gaming data where it needs to go.**
- RFC 2582: The NewReno, RFC 2883: (SACK), RFC 3517: (SACK)-based Loss Recovery RFC 4138: Forward RTO-Recovery (F-RTO) **All have to do specifically with TCP/IP. Some of these enhancements could help gaming if packets are lost, but only on games that use TCP/IP. Does not improve game performance unless packets are lost.**
- TCP/IP QOS + QOS2 Bandwidth controls. **These bandwidth controls are for TCP/IP only. Such bandwidth controls (if they were to be implemented for UDP/IP) would control the sender only (upstream controls).**
- TCP/IP Auto-tuning. **This feature is another way of saying QOS + CTCP and having the two work together. Again TCP/IP only.**
- Explicit Congestion Notification (ECN) for TCP/IP. **This feature is useful for TCP/IP only, and COULD help internet latencies (and gaming performance), but only for TCP/IP games.**
- WSK [Winsock Kernel] / TDI [Transport Driver Interface] **These kinds of interfaces are just another way to write programs (all be it at a lower ‘kernel’ level). Unfortunately they can cause problems, and worse, add to bloat.**
- Windows Filtering Platform: For TCP/IP and Firewalls. **Potentially adds to security + protection on the internet (not gaming performance). Like above it is another way to write programs (at a different level). Adds to bloat.**
- IPV6 Enhancements (mixed stack). **More bloat for no benefit. IPV6 is not taking off anywhere except Asia, and even there, IPV4 x-lation has shown performance benefits.**
- WSAPoll() **Functions like this hurt gaming a lot. They complicate the mixing of TCP and UDP sockets, and in general add more layers of unneeded abstraction to the process.**

In summary, Vista has a lot of new features that enhance TCP/IP throughput capabilities and help TCP/IP packets with QOS on the internet. Games today and in the future do not/will not use TCP/IP (so these improvements can make things worse for games). All these ‘improvements’ are therefore useless for games but add to overall bloat.

The following diagram was borrowed from Microsoft.com TechNet website to illustrate the ‘bloat’. The items circled in ‘red’ were ‘added’ to the new networking stack, and are just more layers of stack to traverse (e.g. bloat).



Will Vista Get Better?

This question requires a crystal ball that this author does not have. It is the opinion of this author that Vista will not get better at online gaming performance any time soon. Why?

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- 1.) Most games use UDP/IP networking for a large number of reasons, and so will never realize the stack improvements that Microsoft has made in its Vista stack. All the improvements are focused on TCP/IP.
- 2.) All this emphasis on TCP/IP will eventually make web-pages load faster, downloads go faster, and torrents share faster, but at a huge cost to online games: bandwidth will simply get sucked up faster, and take away from game data.

Conclusion

Vista is inferior to XP performance-wise in online games today. The enhancements to the Vista network stack were for “throughput” and for “TCP/IP”, neither of which mean anything to online gaming.

Vista will likely never get ‘better’ at online gaming performance, however, it may become the O/S of

choice for a lot of reasons (better downloading, DirectX 10 support, etc.).

The dream of Lag-Free gaming is not here yet, and Vista has taken NO STEPS to make online gaming better.

The best option to improve online gaming performance in Vista or XP is still a Killer NIC powered by LLR Technology which bypasses the Windows networking stack altogether.

The Author

Harlan combined his passion for online gaming, entrepreneurship, and some of his prior engineering skills in Network Acceleration to help found Bigfoot Networks, Inc. The popular Killer NIC (<http://www.killernic.com>) was based on technology of Harlan's own design, and is intended by improve online game-play by bypassing the network stack and offloading processing of network functions to a discreet hardware device.



Harlan honed his business and technical skills while working at Intel, where he filed over 19 patents in the field of Network Acceleration. As an Architect at Intel, Harlan was responsible for the complete solution, including software, hardware, and business cases, for corporate server networking products. After leaving Intel, Harlan joined a start-up called Britestream Networks where he helped develop the first 100% CPU off-load security solution that combines SSL processing with TCP/IP processing on the same chip.

Harlan received his MBA from the University of Texas in 2004, and his B.S.E.E from Ohio Northern University in 1999. Lag is a very personal and real problem to Harlan, because he and his wife Elizabeth met while playing an online game (Ultima Online) in 1997. "Most non-gamers don't realize how big a problem lag is," Harlan said, "However, the gamers know it, the game developers know it, and my company loves fighting it."

When not working or playing with son Christopher or daughter Samantha, you are likely to find Harlan at his ranch tending to his horses, playing online games, or tinkering with his multimedia room.

More Information

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Web Site: <http://www.killernic.com>

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