NETBACKUP

Accelerating backup performance with PORTrockIT

BRIDGEWORKS

EXECUTIVE SUMMARY

Even the most advanced backup software, such as Veritas NetBackup, is only as good as the network connection it operates over. High network latency can kill backup performance, and when packet loss is factored in as well, backups can slow to a crawl.

This paper shows how PORTrockIT can transform the performance of Veritas NetBackup, counteracting the impact of both latency and packet loss, and accelerating backup jobs by a factor of up to 170.

PORTrockIT can help your business achieve faster, more reliable backups – reducing the risk of overruns and ensuring that you get real value from your network infrastructure investment.

"PORTrockIT can transform the performance of Veritas NetBackup, achieving transfer rates that are ***up to 170 times faster*** *than an unaccelerated architecture."*

WHY SPEED MATTERS

As the world becomes more and more data-driven, most companies are seeing significant year-on-year growth in the amount of data they need to store, manage and protect. As a result, backups are becoming a serious issue not just for the IT team, but for the business as a whole.

For resiliency and disaster recovery purposes, most companies want to back up their data off-site, transmitting the data over a wide area network (WAN) to another location which may be anything from a few hundred metres to a few hundred miles away. For technical reasons (which we will explore in the next section), moving large amounts of backup data across a WAN can be a slow process – and as data volumes continue to increase, this can cause major problems.

For example, if backups cannot be completed within the allotted time-window and overrun into business hours, they can have a severe impact on the performance of other business-critical systems.

*"Reducing the size of your backups does not address the **underlying cause** of poor backup performance."*

If a backup consistently runs over the available window, the business may be faced with tough decisions – whether to reduce the size of the backup (and therefore protect less of its data), to extend the backup window (and potentially inconvenience users of other systems), or to invest in even more expensive server and network infrastructure to boost performance.

Modern backup software solutions such as Veritas NetBackup provide advanced features that help to mitigate performance issues – for example, NetBackup's intelligent data deduplication reduces the total amount of data that needs to be transferred across the network. However, while reducing the size of the backup might buy the business some time, it does not address the underlying cause of poor backup performance.

THE PROBLEMS: LATENCY AND PACKET LOSS

The chief culprit for poor WAN backup performance is latency – the time delay between a system sending a packet across the network, and the target system receiving that packet.

The main cause of latency is the physical distance that the packet has to travel. Even with high-speed fibre-optic cabling, latency can increase at a rate of up to 5 microseconds per kilometre travelled.

In addition, the time taken to receive, queue and process packets at either end of the connection, and at any intermediate gateways, can add significantly to the total round-trip time for a system to send a message and receive a response. The further the data has to travel, and the more gateways it has to pass through, the greater the latency.

*"Extra investment in bandwidth will be **wasted** unless the latency and packet-loss issues can be addressed."*

For network traffic sent via the TCP/IP protocol (and almost all backup traffic falls into this category), high latency can cripple transfer rates. TCP/IP works by sending a group of packets, then waiting for an acknowledgement that the packets have been received before it sends the next group.

If the latency of the connection is high, then the sender spends most of its time waiting for acknowledgements, rather than actually sending data. During these periods, the network is effectively idle, with no new data being transferred.

When packet loss occurs, the situation gets even worse. If a packet is lost before it is received by the recipient, or the acknowledgement goes astray before it reaches the sender, TCP/IP automatically reduces the number of packets it sends in the next group, to compensate for the unreliability of the connection. As a result, network utilisation falls even further, because the sender is sending fewer packets in the same amount of time.

Companies often try to solve TCP/IP performance problems by investing in more expensive network infrastructure that offers a larger maximum bandwidth. However, this does not fix the problem. As we have seen, latency and packet loss prevent TCP/IP connections from fully utilising the available bandwidth – so any extra investment in bandwidth will simply be wasted unless the latency and packet-loss issues can be addressed.

THE SOLUTION: PORTROCKIT

PORTrockIT offers a solution to network latency issues. Instead of sending a group of packets down a single physical connection and waiting for a response, the solution creates a number of parallel virtual connections that send a constant stream of data across the physical connection.

As soon as a virtual connection has sent its packets and starts waiting for an acknowledgement from the recipient, PORTrockIT immediately opens another virtual connection and sends the next set of packets.

Further connections are opened until the first connection receives its acknowledgement; this first connection is then re-used to send another set of packets, and the whole process repeats.

This parallelisation practically eliminates the effects of latency by ensuring that the physical connection is constantly transferring new packets from the sender to the recipient: there is no longer any idle time, and the network's bandwidth can be fully utilised.

The solution significantly reduces the impact of packet loss. If one of the virtual connections loses a packet, TCP/IP will only reduce the number of packets in the next group sent by that specific virtual connection. All other virtual connections continue to operate at full speed.

Moreover, PORTrockIT is capable of optimising the flow of data across the WAN in real time, even if network conditions change. The solution incorporates a number of artificial intelligence engines that continuously manage, control and configure multiple aspects of PORTrockIT – enabling the appliance to operate optimally at all times, without any need for input from a network administrator.

*"PORTrockIT delivers **faster network transfer performance**, without any need to make changes to the rest of the network."*

In practical terms, PORTrockIT is installed as a pair of appliances, deployed at either end of the WAN. The backup server simply passes data to the PORTrockIT appliance on the near side of the WAN, which manages the virtual connections to the second PORTrockIT appliance on the far side of the WAN. Once the second PORTrockIT appliance begins receiving packets, it routes them seamlessly to the recipient server. The effect is simply much faster network transfer performance, without any need to make any changes to the rest of the network architecture.

TURNING THEORY INTO PRACTICE

To demonstrate the kind of results that PORTrockIT can deliver for Veritas NetBackup customers, Bridgeworks conducted a set of performance tests at an independent testing facility in the UK. The test infrastructures mimicked a real-world NetBackup architecture, using a WANulator to simulate different levels of latency and packet loss between the backup client (the sender of the backup data), and the backup server (the recipient).

TEST EQUIPMENT

SOFTWARE:

- Veritas NetBackup 7.6.0.3

HARDWARE:

- (Client) Windows Server 2012 R2: IBM x3250, 4 GB RAM, Intel Xeon E31230 3.2 GHz
- (Server) Windows Server 2012 R2: DELL R710, 8 GB RAM, 2 x Intel Xeon E5506 2.13 GHz, DELL SAS HBA
- 2 x PORTrockIT nodes
- IBM Ultrium HH LTO5 SAS tape drive with LTO5 tape
- WANulator host

The first set of tests were performed on an unaccelerated architecture, where the client and server were connected directly to the WANulator (see figure 1). The same tests were then repeated on an architecture that was accelerated by introducing two PORTrockIT appliances, which sat either side of the WANulator, between the client and the server (see figure 2). In both cases, the server was connected to an LTO5 tape drive, which would ultimately store the received backup data.

WHAT THE DATA TELLS US

LATENCY

The first test simulated a scenario with no packet loss, at latencies ranging from 0ms to 360 ms round trip time (RTT). A 40 GB data set was transferred from the backup client to the backup server, first via the unaccelerated architecture, and then again via the accelerated architecture with PORTrockIT. The data set was created using highly compressible data, to ensure that no adverse effects on performance would be introduced by the tape device.

Figure 1: Unaccelerated infrastructure

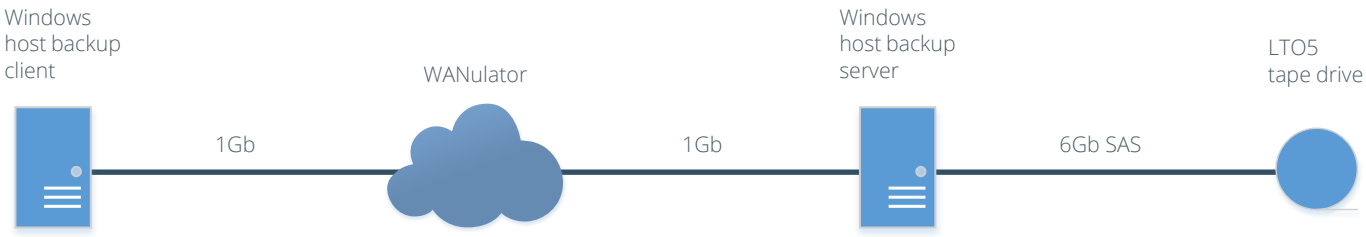
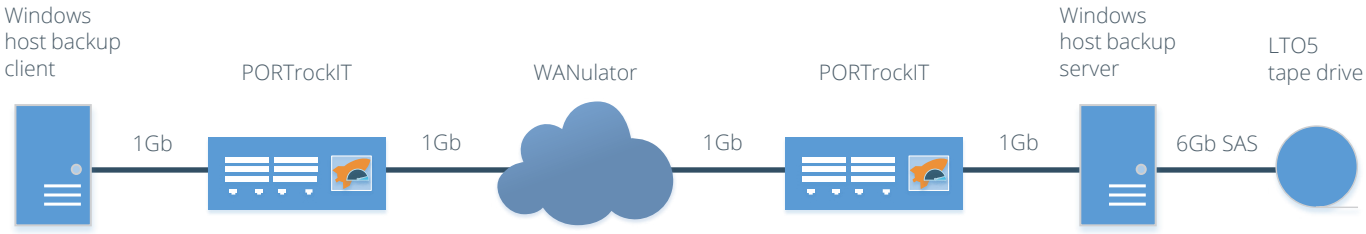


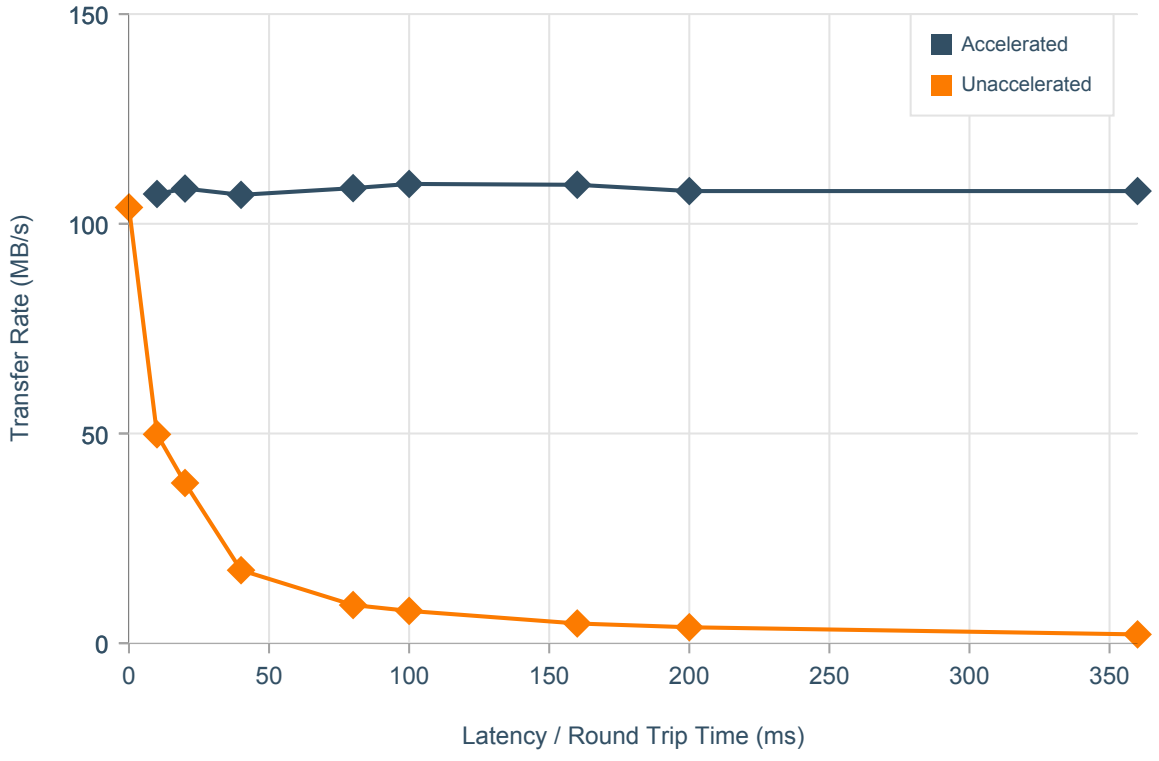
Figure 2: Accelerated infrastructure with PORTrockIT



(NOTE: Unlike WAN optimisation products which use compression or deduplication techniques to improve throughput, PORTrockIT transfers data as-is, without making any modifications. This means that PORTrockIT is able to accelerate deduped, compressed or encrypted data transfers to exactly the same extent as it accelerates as any other data type.)

Looking at Figure 3, the results show that performance on the unaccelerated architecture degraded significantly as latency increased. By contrast, the accelerated architecture with PORTrockIT provided a stable transfer rate of more than 100 MB/s at all latencies. In the case of a network with 360 ms of latency, the performance gain with PORTrockIT was 105.7 MB/s – making the transfer rate more than 50 times faster.

Figure 3: Accelerated and unaccelerated performance at various latencies with 0% packet loss



PACKET LOSS

The second test investigated the performance of the two architectures on a network with zero latency, but with various levels of packet loss. Again, a highly compressible 40 GB data set was transferred from the backup client to the backup server using both the unaccelerated and accelerated architectures.

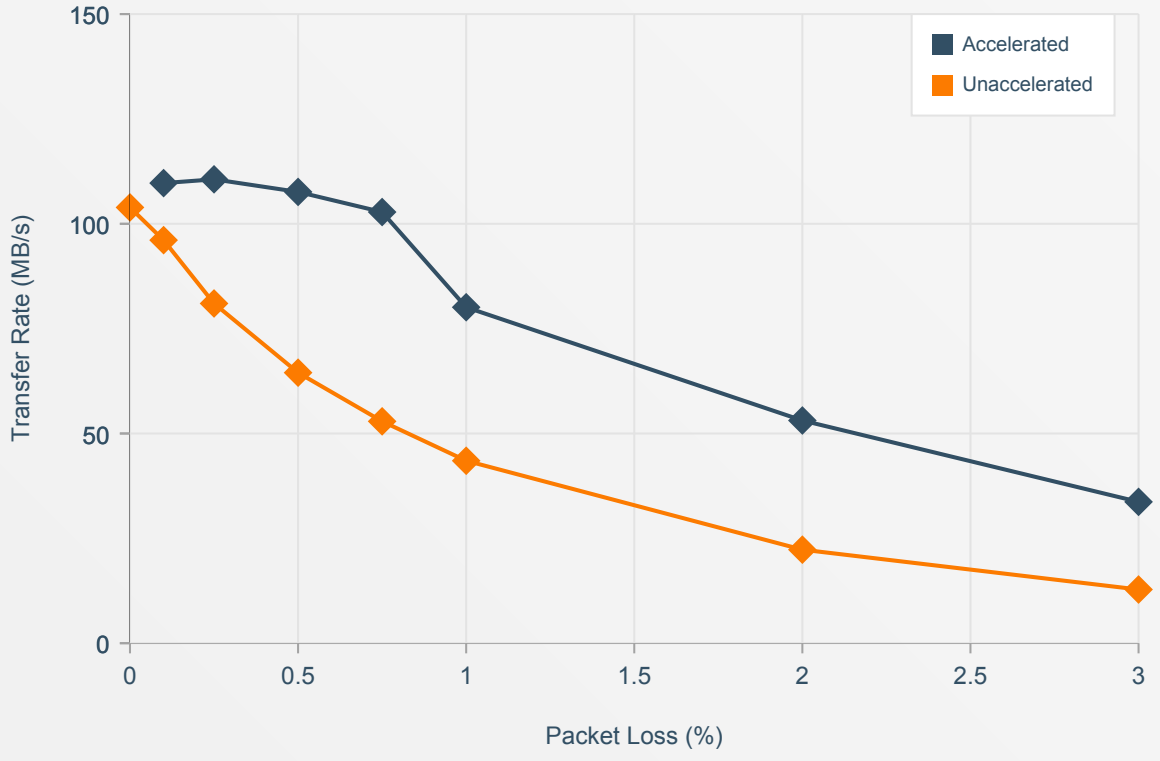
From Figure 4, we can see that for both architectures, performance degrades as packet loss increases – but in all cases, performance is considerably higher with the accelerated architecture.

"At 360 ms of latency PORTrockIT was was more than ***50 times faster*** *than an unaccelerated architecture."*

COMBINED EFFECTS OF PACKET LOSS AND LATENCY

Finally, the team decided to test three different packet loss scenarios (0.1%, 0.5% and 1%) at various levels of latency.

Figure 4: Accelerated and unaccelerated performance at various levels of packet loss with zero latency



However, based on the results of the previous tests, Bridgeworks estimated that it would take many days to test all of these scenarios on the unaccelerated architecture using a 40 GB data set.

The team therefore decided to use two different data sets for the remaining tests: the same 40 GB data set for tests on the accelerated architecture, but a smaller 1 GB data set for the unaccelerated architecture. As before, both data sets contained highly compressible data, to avoid adverse effects from the tape drive.

Figures 5, 6 and 7 all show that the unaccelerated architecture saw severe performance degradation from the combination of latency and packet loss. In all three scenarios, the accelerated architecture performed considerably better. Even in the most extreme example (360 ms of latency with 1% packet loss) the accelerated architecture achieved a transfer rate of 15.5 MB/s – more than 170 times faster than the unaccelerated transfer rate of 0.09 MB/s

Figure 5: Accelerated and unaccelerated performance with 0.1% packet loss at various levels of latency

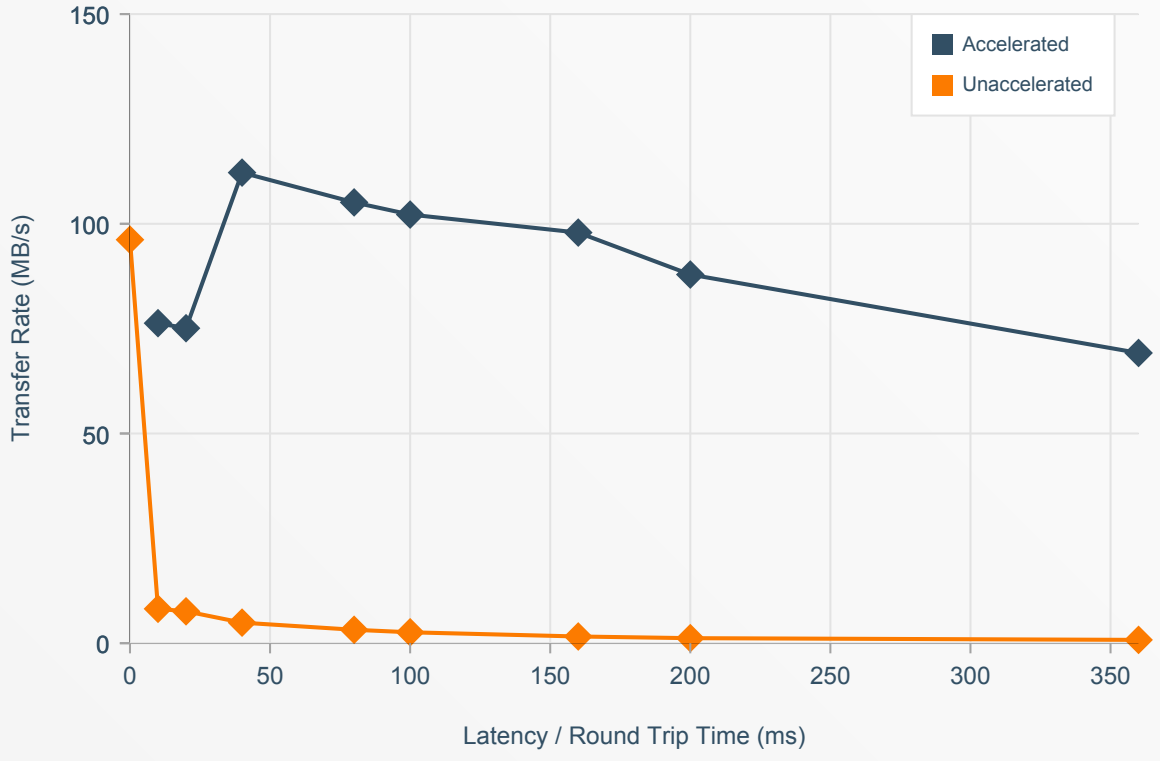


Figure 6: Accelerated and unaccelerated performance with 0.5% packet loss at various levels of latency

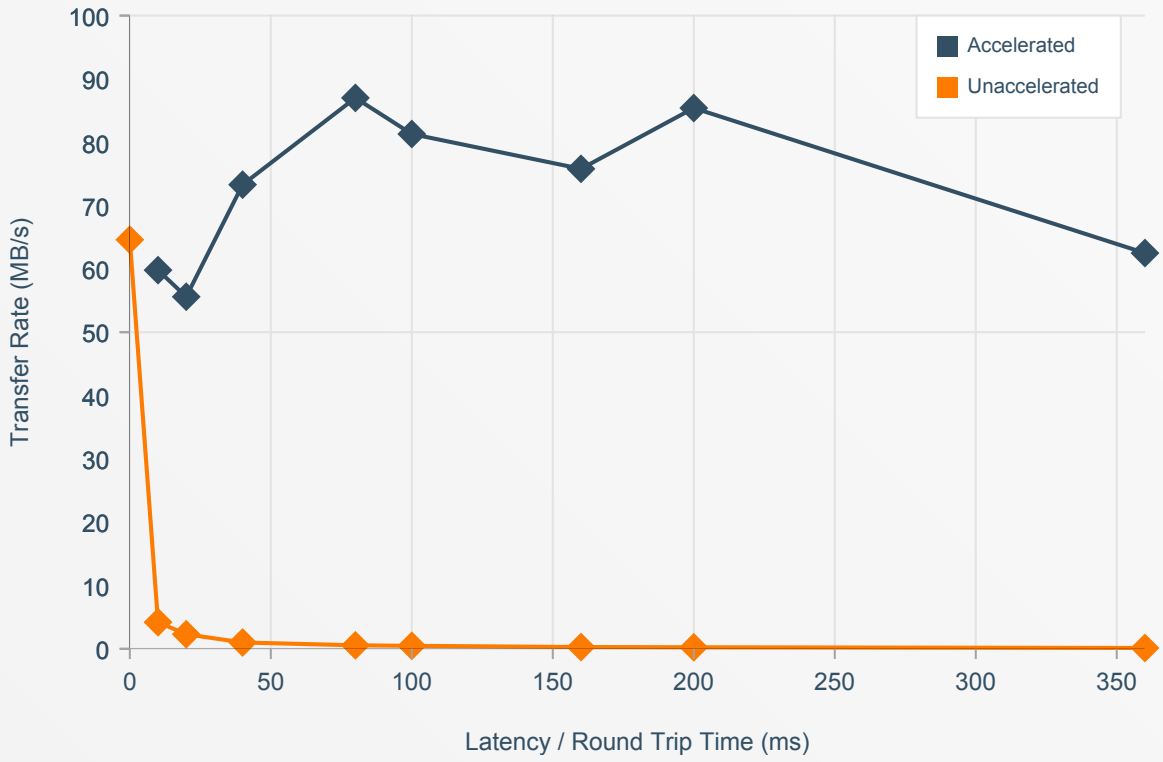
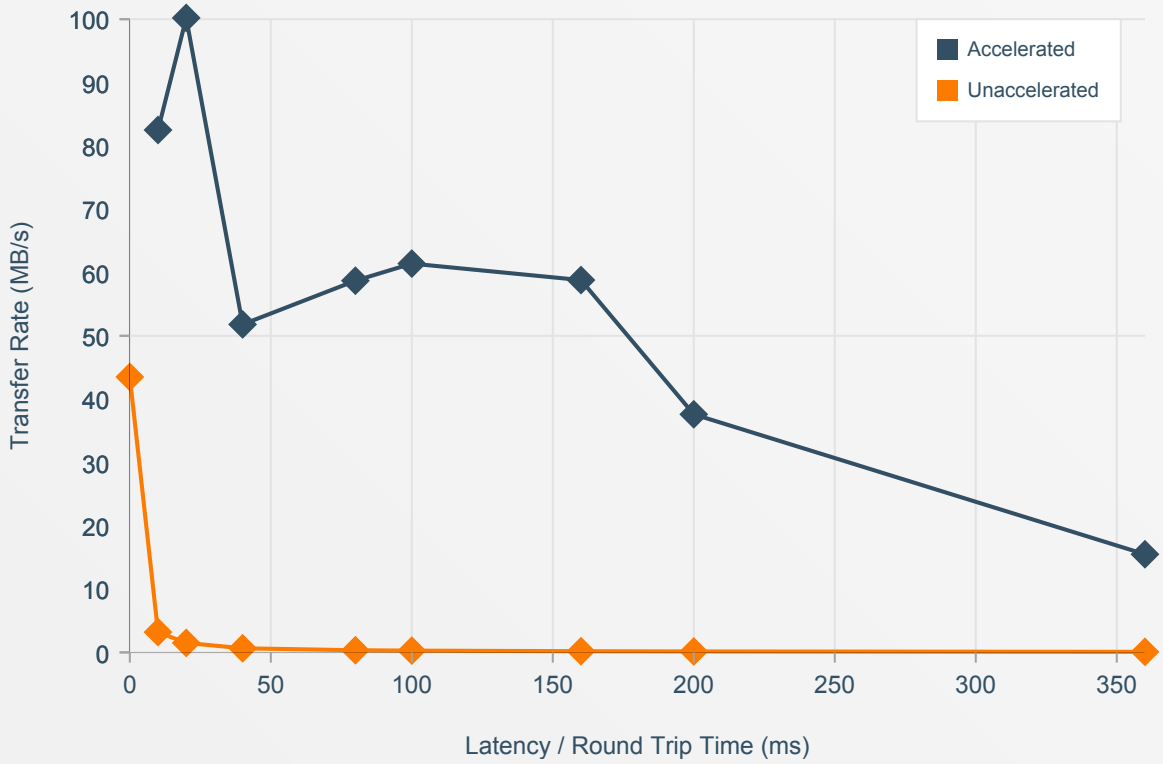


Figure 7: Accelerated and unaccelerated performance with 1% packet loss at various levels of latency



REALISING THE BUSINESS BENEFITS

For companies that use Veritas NetBackup for WAN backup management, PORTrockIT can transform backup performance. If backups are threatening to overrun the available window, or if it is desirable to reduce backup times to free up server and network resources for other important jobs, PORTrockIT provides an elegant solution.

> *"At peak performance, PORTrockIT was more than **170 times faster** than the unaccelerated architecture."*

PORTrockIT offers plug-in-and-go technology that can be implemented quickly with minimal impact on the rest of your IT infrastructure – keeping deployment cost and risk to a minimum. By maximising the performance of existing infrastructure, PORTrockIT reduces the need to invest in expensive high-bandwidth connections or more powerful backup servers – enabling significant cost-avoidance.

ABOUT THE AUTHOR

David Trossell has been part of the IT industry for over 30 years, working for infrastructure specialists such as Rediffusion, Norsk Data and Spectra Logic before joining Bridgeworks in 2000 as CEO/CTO. He is a recognised visionary in the storage technology industry, and has been instrumental in setting the company's strategic direction and developing its innovative range of solutions. David is the primary inventor behind Bridgeworks' intellectual property, and has authored or co-authored 16 international patents.

TAKE THE NEXT STEPS

To learn more about PORTrockIT and other smart networking solutions from Bridgeworks, please visit www.4bridgeworks.com, or call us on +44 (0) 1590 615 444.