

z15 Embedded Compression and Encryption

IBM Z enables new capabilities for secure and efficient disaster recovery



Disaster Recovery for mid-tier IT

Many mid-tier IT enterprises today prepare for business continuity by preparing daily system backups. These backups are stored or sent to co-locations so that operations can be restored quickly in the event of an extended primary system outage brought about by an emergency or disaster.

For many IT operations tape backup is the preferred method

Tape backup is one of the least expensive means of storing and transmitting backup data for recovery. However, it involves handling, storage, encryption, and tracking. These steps add cost and exposure to secure systems operation. The potential for loss or mishandling is real as humans are involved in each step of the process. Encryption of information on tapes is a must as a lost tape could mean exposed data. Of course, this requires the overhead of encryption and the proper handling of encryption keys. A lost or misplaced key (not to mention an exposed key) would cause the total loss of information.

Secure transmission over networks would be ideal

Network transmission of backup data would be ideal but transferring the large amounts of data necessary for a full restore of operations can be time consuming and costly. A combination of encryption and compression of data would reduce transmission costs and protect data transmitted over lower cost public links, but this involves a tradeoff between computational cost and transmission cost.

Introducing IBM z15™ encryption and compression offload

The new IBM z15 server from IBM provides high speed on-chip compression and encryption to greatly reduce the overhead compared to performing these operations using prior IBM Z® servers. Combined compression and encryption can enable IT operations to eliminate tape transmission of backup data to reliably and securely transmit via networks to remote sites much more affordably.

Transmission by tape is relatively cheap compared to network transmission

Let's take a look at tape transmission and handling costs. For the purposes of this analysis we will include tape handling costs on each side. These would be costs for loading/unloading, logging tape volumes, security and handling audits periodically, etc. We will assume half of a person year on each side for 1 PY total. A bonded courier would be required for transporting the tapes. Courier costs are typically charged based on miles driven. We will assume that the recovery site is 100 miles from the primary site. Of course, we will need to pay for a round-trip (tapes over and tapes back) for a total of 200 miles. Bonded courier rates are typically about \$2/mile for a daily cost of \$400 and an annual cost of about \$150,000. Assuming 1 PY for handling we have a total of \$300K per year for tape transmission.

Cost of Tape Transmission of Daily Backups		
Bonded Courier Costs		
	Cost per Mile	\$2.00
	Round trip miles	200
	Annual cost	\$146,000.00
Tape Handling Costs		
	Personnel	\$150,000.00
Total Cost of Tape Transmission		\$296,000.00

Without compression transmission by network would require 7 hours and \$1M per year

This is quite cheap compared to current costs for encrypting, compressing, and transmitting over network links. Current rates for network transmission are about \$5000 per 10Gb link¹ per month. A transmission rate of 10GB per month would cost \$40K or \$480K per year.

Transmission capabilities would be required on both the outbound side and the inbound side for doubling the cost to \$960K annually. Assuming that we need to transfer 250TB for backup, the elapsed time using a 10GB transfer rate would require nearly 7 hours to complete. To summarize, nightly backup of 250 TB would require 7 hours at an annual cost of nearly \$1M.

Cost of Uncompressed Network Transfer		
Cost of 1 link	Monthly 10Gb Link	\$5000
Cost of 8 links	Monthly 10GB Link	\$40,000
Cost of Inbound	Annual Bandwidth Cost	\$480,000
Cost of Outbound	Annual Bandwidth Cost	\$480,000
Total Annual Transmission Cost		\$960,000
Data Transfer Amount		250TB
Transfer Time in Hours		6.94

z15 compression and encryption makes network transmission competitive with tape

Research by the IT Economics team shows that transmission of backup data by secure means using z15 would reduce data volume by 80% with little or no additional computational cost. Reducing the volume would allow fewer network transmission paths or less time or some combination of the two. So, for example, reducing network links required to achieve transmission of 250TB in the same elapsed time would reduce cost to \$240K per year making it competitive with tape transmission while at the same time reducing elapsed time by over 1 and ½ hours and providing a secure and easily auditable transfer.

¹<https://cloud.ibm.com/docs/infrastructure/direct-link?topic=direct-link-pricing-for-ibm-cloud-direct-link#arranging-for-direct-link-connectivity>

Reducing data transmission cost		
80% reduction of 250 TB	Monthly 10Gb Link	\$5000
Cost of 2 links	Monthly 2.5GB Link	\$10,000
Cost of Inbound	Annual Bandwidth Cost	\$120,000
Cost of Outbound	Annual Bandwidth Cost	\$120,000
Total Annual Transmission Cost		\$240,000
Data Transfer Amount		250TB
Transfer Time in Hours		5.56

Or, for slightly more than the cost of tape transmission, elapsed time could be reduced by nearly two and a 1/2 hours with secure, reliable, and convenient network transfer.

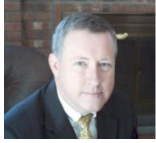
Reducing data transmission elapsed time		
80% reduction of 250 TB	Monthly 10Gb Link	\$5000
Cost of 3 links	Monthly 3.75GB Link	\$15,000
Cost of Inbound	Annual Bandwidth Cost	\$180,000
Cost of Outbound	Annual Bandwidth Cost	\$180,000
Total Annual Transmission Cost		\$360,000
Data Transfer Amount		250TB
Transfer Time in Hours		3.7

z15 with built-in encryption and compression makes secure network transmission of backup data both feasible and affordable

The new z15 platform now provides both hardware assisted compression and encryption of data. The combination of these technologies allows a reduction in data volume of 80% while simultaneously encrypting ALL data necessary for backup. Combined with IBM Z key-management support, IT operations can securely and efficiently transfer data to remote backup sites. Compression of the data means that 250 TB of data requiring 7 Hours to transmit can now be transmitted at a lower cost and elapsed time making it competitive with less reliable and secure transmission via tape backup. Since this work is offloaded to embedded compression and encryption technologies in the new z15 microprocessors, this can be achieved with little or no computational overhead.

The z15 platform delivers on IBM's commitment to reliable and secure operations for the most important and sensitive systems.

About the author



Roger Rogers is an IBM Executive IT Economics Consultant for the IBM IT Economics team and works with clients worldwide to optimize their IT operations. He has more than 35 years of experience in product development, management, and strategy. During his tenure at IBM Roger has received two IBM Outstanding Technical Achievement awards and has been recognized in IBM's Top 500 IBM Employees list. He is also a frequent speaker at IBM conferences.



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