Why Select Parallel Data Mover (PDM)

For Managed File Transfer

Robust Managed File Transfer

There are numerous products and facilities available to move data files from one platform to another. The merits and capabilities of these products range from basic file movement functionality, like FTP, to comprehensive products, like PDM, aimed at large complex enterprises with demanding requirements.

Managed File Transfer (MFT) is an industry term that unfortunately does not have a widely accepted set of features or facilities. Products often claim to be Managed File Transfer products if they perform any function beyond base FTP functions. Alebra's concept of MFT includes a robust set of features and facilities that allow customers manage effectively, using a minimum amount of human resources, tens of thousands or even hundreds of thousands of file transfer operations daily while insuring data integrity and security. Below is a partial list of the capabilities found in PDM.

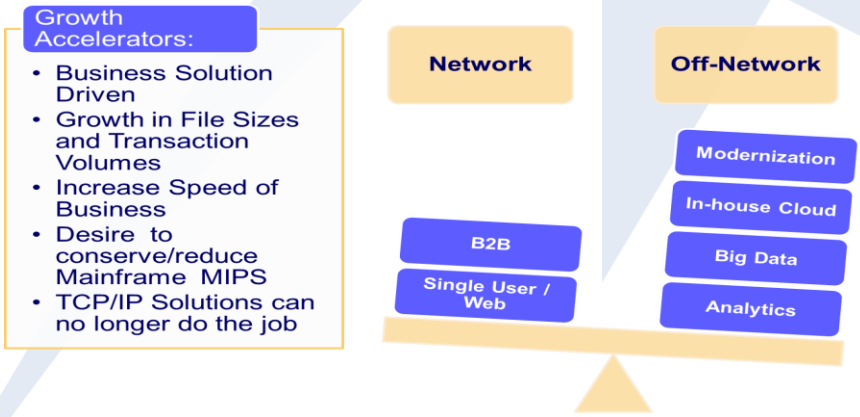
- **Operating System Support –** z/OS, Linux (Intel/AMD and System z), AIX, HP/UX, Solaris and Windows
- **Robust feature rich clients** – comprehensive command set, stored procedures and local and global symbol substitution
- **Transaction Queuing** – practically unlimited queue size determined by customer
- **Transaction Scheduling –** schedule transactions based on priority, available resources and maximum concurrent transfers set by customer
- **Transaction Monitoring –** users may monitor their transactions, PDM Administrators or designated users may monitor entire system
- **Status Reporting –** Users receive detailed completion status and comprehensive error messages and codes
- **Transaction Logging (optional SMF records) –**support for auditing, compliance and operations (performance analysis and reporting)
- **Intelligent Error Recovery**
- **Checkpoint/Restart**
- **Network and Off-network Data Transfer Technology –** TCP/IP, CTC's and z/OpenGate
- **Scalability –** hundreds of thousands of daily transfers, 350 concurrent transfers per image, 999 data paths per system and massive bandwidth potential
- **Strict Adherence to Customer's Existing Security Measures –** RACF, ACF2, Top Secret, et al. on z/OS - User ID and Password checks on Open Systems
- **Data Integrity Controls and Checks**
- **Data Piping to/from Programs** – all platforms including z/OS

- **Extensive Data Translation Options –** Standard EBCDIC/ASCII, user defined tables and support of double byte and multi-byte codes
- **Comprehensive Variable Length Record Support** – user selectable options
- **Data Encryption-** industry standard AES 256-bit keys
- **Data Compression –** automatic support of IBM's zEDC hardware feature when available and software compression for all other systems
- **Support of z/OS HSM Archived Data**
- **Performance Analysis –** detailed reporting including breakout of where time was spent (source and target disks, transport time, processor usage, etc.)

Due to the unique nature of PDM's off-network technology and data piping capabilities, the sections below provide a detailed description of these facilities.

Off-network Data Transfer Technology

Compared to channel-based off-network data transfer, conventional TCP/IP networks have lower throughput and consume significantly more CPU resources. Even very efficient products like PDM will consume approximately 100 MIPS of z/OS processing resources for every 100 MB/second of data transfer rate when using TCP/IP. Other products generally consume much more. In addition to CPU resources, large bulk data transfers may negatively affect other interactive network users in meeting response time objectives. With the increasing demands to move more data faster, enterprises are increasingly seeking off-network alternatives for bulk data transfers. The diagram below depicts some of the industry trends creating this demand.



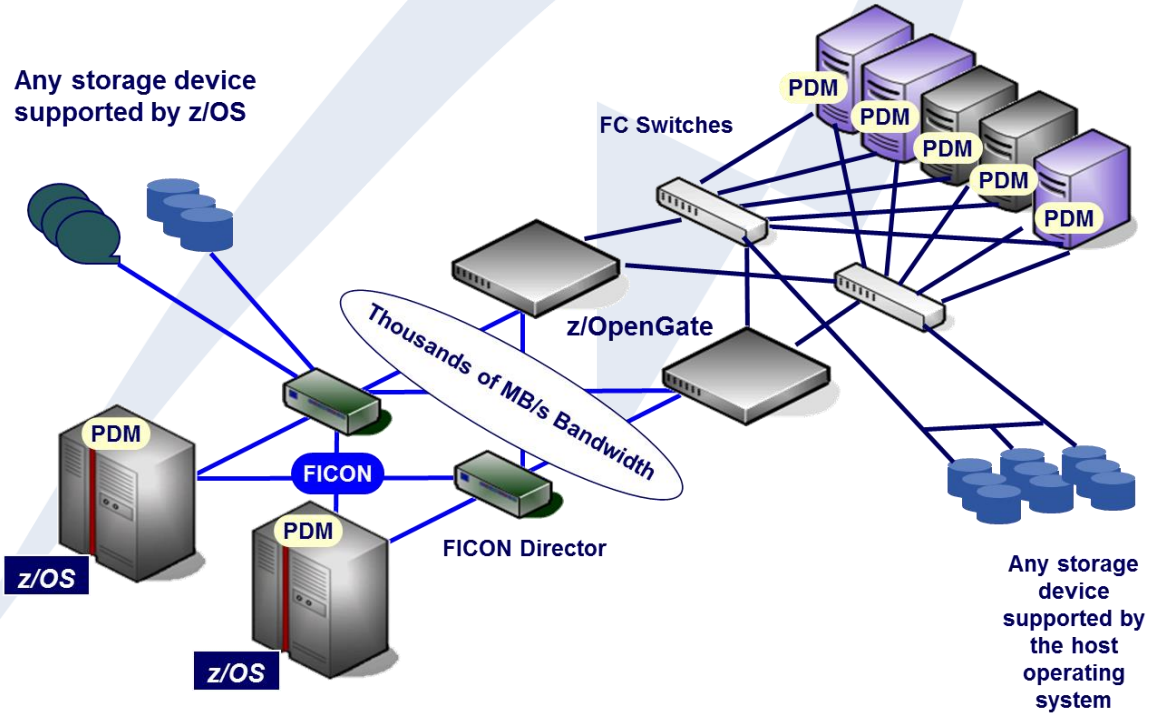
PDM offers two types of off-network technology:

- z/OS to z/OS using Channel-to-Channel Adapters (CTCS's)
- z/OS to Linux/UNIX/Windows using Alebra's z/OpenGate

First, let's examine the use of CTC's between z/OS systems. When z/OS partitions are not in the same Sysplex or do not use shared disk devices, enterprises typically use file transfers to move data files between the systems. While PDM supports the use of TCP/IP or Hipersockets for these transfers, the use of CTC's is the preferred option. When using CTC's, PDM uses low-level I/O calls with native CTC protocol to transfer data. As a result, excellent bandwidth and CPU utilization approximately 1/5 that of TCP/IP or Hipersockets is achieved.

Other than PDM, very few products support CTC's. These products typically use the z/OS provided VTAM access method to drive the CTC connection. This use of VTAM results is slightly degraded bandwidth and much higher CPU utilization. The PDM CTC support is clearly faster and more efficient.

Next, let's examine transfers between z/OS and Linux/UNIX/Windows systems using Alebra's z/OpenGate transport. The z/OpenGate is an easily installable independent device that attaches mainframe FICON channels and Open Systems Fibre Channel links to create a FICON/Fibre Channel gateway. Driven and managed by PDM software, the z/OpenGate is the fastest and most efficient data transport available. Configuring two or more z/OpenGate units as depicted below creates a high availability, fault tolerant and massively scalable configuration.



PDM drives data transfers in a true streaming mode. That is to say that the sending systems continuously write data to the z/OpenGate while the receiving systems are continuously reading data. Multiple data buffers in the sending and receiving system as well as very large number of

buffers in the z/OpenGate ensure that a pipelined data flow proceeds at the fastest possible rate. End-to-end error checking and error recovery provides complete assurance that file is stored on the target system exactly as intended and with complete data integrity. The channel technology used is inherently secure and, for most enterprises, meets security requirements without the additional need of encryption.

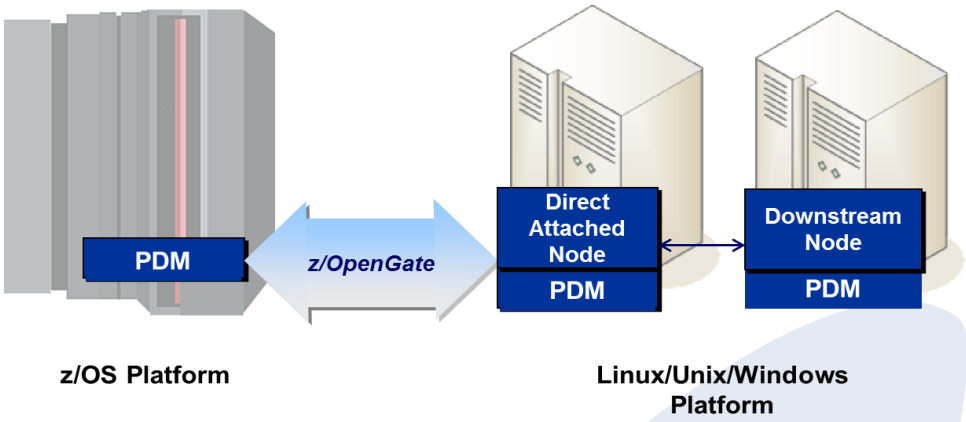
While channel based I/O consumes significantly less CPU resources (MIPS) than TCP/IP, Alebra took two additional measures Alebra to reduce CPU consumption further. First, all z/OpenGate I/O operations use low-level I/O instructions and native channel programming to eliminate overhead associated with z/OS provided access methods. Secondly, normal I/O operations require the z/OS I/O Supervisor to PAGEFIX I/O data buffers in real memory and translate virtual storage addresses to real storage addresses for each I/O operation. PDM eliminates this overhead by issuing PAGEFIX for data buffers and translating addresses once at the beginning of the file transfer. PDM continuously reuses these buffers until the file transfer is complete. The low-level I/O call issued by PDM informs the z/OS I/O Supervisor that the need to PAGEFIX the buffer and translate the memory address is not required.

The customer benefits of Alebra's implementation are as follows:

- **Fastest Transfer Rate** - Using z/OpenGates for end-to-end connectivity between z/OS and LUW systems provides the fastest transfer speed and highest bandwidth available in the industry. Current customers routinely transfer multiple terabytes of data within minutes.
- **Off-Network** - The data transfers are accomplished off-network. This relieves a customer's existing communications networks from the burden of large bulk data transfers that affect other network traffic.
- **Lowest Processor Overhead** – When using the z/OpenGate transport, PDM has the lowest overhead in the industry. For z/OS systems, there is a 20 times reduction in overhead compared with traditional network-based transfer products. As TCP/IP networks get faster, the drain on processors increases significantly compared to the z/OpenGate solution.
- **Highly Secure** – z/OpenGates use the same channel architecture as used by large datacenters to transfer data between servers and high-speed storage devices. This off-network technology is inherently secure and for most datacenter environments fulfils security requirements without the need for high overhead encryption technology.

Complementing the z/OpenGate technology is PDM's support of direct attached and downstream nodes. As described above, standard end-to-end z/OpenGate connections require the LUW servers have Fibre Channel connectivity. Some LUW systems do not have Fibre Channel connectivity or the requirements do not warrant the expense of adding Fibre Channel HBA's. A

rack of blade servers is one example. Another example is a z/OS datacenter with remote LUW servers. For these cases, Alebra offers an alternative configuration as depicted below.



The direct attached node in this configuration can be a dedicated LUW server or any existing LUW server with connectivity to z/OpenGate(s) and network connectivity to the downstream node. Data passes through, but not stored, on the direct attached node.

The benefits of this configuration are as follows:

- **Full functionality** – Transfers between z/OS and the downstream nodes have full PDM functionality as if the end points are directly attached. Users are unaware that the data is actually passing through the direct attached node.
- **Off-network transfers to/from z/OS system** – Standard communications links to the z/OS system (OSA Adapters) are not used for data transfer. Mainframe communications adapters are often the busiest links in a communications network and will greatly benefit from the offloading of bulk data transfer.
- **Much reduced z/OS overhead** – As with standard z/OpenGate-attached systems, avoiding the use of z/OS TCP/IP results in a 95% reduction in z/OS processing overhead.

Enterprises have very few options available that deliver off-network data movement. Alebra's z/OpenGate is the only option that is not bundled as a feature of a vendor specific disk subsystem. Compared with these other options, the z/OpenGate is faster, requires less CPU overhead, easier to install and manage and is supported by robust managed file transfer. Additionally, customers have complete freedom in their buying decisions for replacement or additional disk storage capacity.

DATA PIPING ON ALL PLATFORMS

Like PDM, several file transfer products support the use of piping data directly to/from programs and executables on Linux/UNIX/Windows systems. However, PDM uniquely has the ability to perform this functionality on z/OS. PDM accomplishes this capability by utilizing the standard IBM provided Subsystem Interface (SSI). Any program that sequentially reads or writes data can access data on another system.

Below is sample z/OS JCL that executes a standard IBM utility program to compare two datasets.

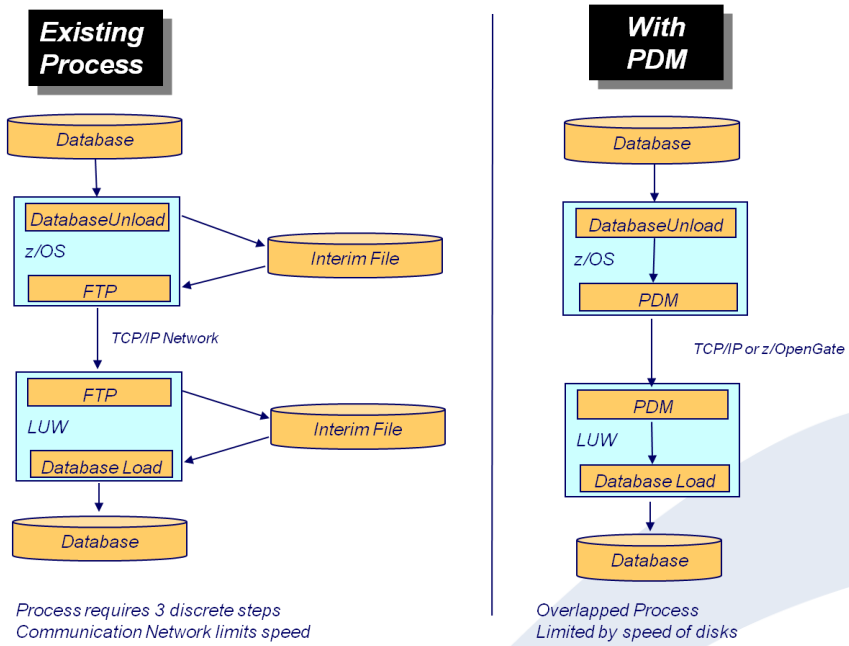
```
//USERJOBA JOB..
//COMP   EXEC PGM=IEBCOMPR
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD DSN=USER1.FILE1,DISP=SHR
//SYSUT2 DD DSN=USER1.FILE2,DISP=SHR
//SYSIN DD DUMMY
```

With PDM, one or both files may reside on another server. In the example below, the second file resides on a UNIX server.

```
//USER1JOBB   JOB..
//COMP EXEC PGM=IEBCOMPR
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD DSN=USER1.FILE1,DISP=SHR
//SYSUT2 DD DSN='\tmp\file2',DCB=(RECFM=FB,LRECL=80,BLKSIZE=8000),
//  SUBSYS=(DMES,'PROFILE=MYPROF','HOST=unixhost','USER=myid','PASS=mypass')
//SYSIN DD DUMMY
```

The SUBSYS parameter specifies the name of the PDM subsystem (DMES) and provides the security credentials necessary to access the file. As the program reads data for this file, PDM directly supplies the data from the file on UNIX. Without PDM, a file transfer operation is required to copy the UNIX file to z/OS before this program can execute. PDM eliminates the time and disk space required for this separate file transfer.

Another example of using this unique PDM capability, which pipes data between z/OS applications and LUW applications, is shown in the diagram below.



This example shows an existing three-step process that unloads a DB2 database, transfers the data to a Linux/UNIX/Windows system and finally builds a database on LUW. Using a combination of the SSI on z/OS and data piping on LUW, PDM overlaps these three steps saving significant elapsed time. Additionally, this technique eliminates storage space for interim files as well as the processing time to create these interim files. With PDM, business processes can be simplified, streamlined and optimized for much improved speeds and reduced system resources.

Conclusion

With Alebra's PDM large enterprises can move more data, much faster and more efficiently than any other product. Its robust set of features meets the most demanding needs of large enterprise users. Save money, time and headaches by deploying PDM for your managed file transfer requirements.

ADDITIONAL RELATED INFORMATION

The following links to the Alebra website provided additional related information.

Technical Brief - **The Benefits of Managed File Transfer**

http://alebra.com/wp/wp-content/uploads/2013/12/TB-ManagedFileTransfer.pdf

Whitepaper - **Options to Connect z/OS and Linux/UNIX/Windows Systems**

http://alebra.com/wp/wp-content/uploads/2015/02/Options-to-Connect-zOS-and-Linux-UNIX-Windows-System-with-PDM.pdf

Whitepaper - **When to Use z/OpenGate versus TCP/IP Transports**

http://alebra.com/wp/wp-content/uploads/2013/12/TB-zOpenGateversusTCPIP-Transports-.pdf

Blog Post - **Saving Mainframe MIPS with PDM**

http://alebra.com/2013/saving-mainframe-mips-with-pdm/

Whitepaper - **Encryption Support Provided by PDM**

http://alebra.com/wp/wp-content/uploads/2014/05/Encryption-Support-Provided-by-PDM.pdf

Technical Brief - **Data Compression Support Provided by PDM**

http://alebra.com/wp/wp-content/uploads/2014/05/Data-Compression-Support-Provided-by-PDM.pdf

Whitepaper - **Assuring Data Integrity with PDM**

http://alebra.com/wp/wp-content/uploads/2015/03/Assuring-Data-Integrity-With-Parallel-Data-Mover-PDM.pdf