NEW FEATURES IN EMC ENGINUITY 5875 FOR MAINFRAME ENVIRONMENTS

Abstract
This white paper discusses the new features and functionality introduced with the Enginuity™ 5875 code release for EMC® Symmetrix® VMAX™ subsystems in the IBM System z environment.

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Executive summary

The availability of Enginuity™ 5875 for the EMC® Symmetrix VMAX™ platform provides the mainframe user with significantly enhanced functionality aimed at addressing a substantially higher degree of cost-effectiveness, unparalleled configuration flexibility, and higher degrees of performance, availability, reliability, and serviceability. This release delivers to the mainframe user Data at Rest Encryption (DARE) and key management, enhancements to SRDF®/A, enhancements to XRC, electronic license management, and more.

The Enginuity storage operating environment provides the intelligence that controls all components in an EMC Symmetrix® storage array.

Enginuity is an intelligent, multitasking, preemptive storage operating environment that controls storage data flow. It is wholly devoted to storage operations and optimized for the service levels required in high-end environments. While it shares many traits with the operating systems typically used to run large host computers, Enginuity is more specialized and specifically optimized for storage-based functions. It is driven by real-time events related to the input and output of data. It applies self-optimizing intelligence to deliver the ultimate performance, availability, and data integrity required in a platform for advanced storage functionality. A prerequisite for complex, demanding, risk-intolerant IT infrastructures, Enginuity—coupled with Symmetrix—is the essential foundation technology for delivering advanced and cost-effective high-end storage services.

Enginuity, as a proven storage operating environment, carries all of its extended and systematic development forward in each successive Symmetrix platform generation—a major operational and investment protection benefit to users. That means that all of the reliability, availability, and serviceability features, all of the interoperability and host operating systems coverage, and all of the application software capabilities developed by EMC and its partners continue to perform productively and seamlessly even as underlying technology is completely refreshed. All these features and capabilities are fully operational from day one in each Symmetrix release.

Enginuity 5875 continues the long tradition started with its predecessor releases in continually resetting the functionality benchmarks to unparalleled levels, thereby offering its users uncompromising choices.

Audience

This white paper is intended for mainframe system programmers, storage administrators, operations personnel, performance and capacity analysts, technical consultants, and other technology professionals who need to understand the features and functionality capabilities of the Symmetrix VMAX subsystem at a closer architectural level.

While this paper deals with the new features as stated, a comprehensive understanding of all mainframe features offered in Enginuity prior to this release can
be gained by looking at similarly titled white papers (for example, *New Features in EMC Enginuity 5874 for Symmetrix Mainframe Environments*).

The focus of this white paper is on the new Enginuity 5875 features for mainframe environments. For open systems environments, see the white paper *New Features in EMC Enginuity 5875 for Open Systems Environments*.

**Introduction**

Enginuity 5875 is the second release of Enginuity to support the Symmetrix VMAX platform with the intent to provide additional functionality over its predecessor Enginuity 5874, whose principal purpose was initial support for the new VMAX architecture.

Enginuity 5875 builds on the base functionality already delivered in the Enginuity 5874 service release (delivered in Q3 2009) by adding substantial enhancements to the VMAX platform such as sub-LUN storage tiering; Virtual LUN (VLUN) enhancements; enhanced replication capabilities such as Concurrent SRDF/A and simultaneous clone; Data at Rest Encryption and key management; electronic licensing, and more. This is all provided within a framework of unparalleled levels of cost reduction and ease of management.

From a pure competitive viewpoint, Enginuity 5875 and VMAX leverage an increasingly differentiated feature set that includes a superior tiered storage offering with transparent tier management; a better performance-effective deployment of large capacity drives (SATA); a more cost-effective Enterprise Flash Drive (EFD) deployment; and the most power-efficient storage subsystem design in the industry.

**Multitrack High Performance FICON (zHPF multitrack)**

Multitrack High Performance FICON is a major FICON performance enhancement targeted for high-traffic FICON environments with the right mixture of certain access methods. It builds on the already released version of High Performance FICON (zHPF) as a simple extension to that base feature. zHPF multitrack extends the number of tracks to be processed by a zHPF I/O from one to a maximum of 255; no other changes were made to the zHPF feature since the initial zHPF implementation already contained the basic framework for multitrack designed into it. zHPF multitrack extends the initial zHPF implementation by allowing the count field in the LOCATE RECORD EXTENDED parameters of the PREFIX and PREFIX READ commands to be in the range 1 to 255 inclusive.

A more detailed discussion of zHPF, its command sequences, requirements, and enabling/disabling, controlling, measuring, monitoring, and other operations on Symmetrix VMAX is available in the white paper *EMC Enginuity 5874 Enhancements for Symmetrix VMAX Mainframe Environments — A Detailed Review*. Other publications (both EMC and non-EMC) discuss this topic in extraneous detail and are contained in the References section of this paper.
zHPF multitrack is supported on all Symmetrix VMAX platforms that support the base zHPF function. It does not require any changes to the current physical or logical configuration, hence the same configuration that supports zHPF will be capable of supporting zHPF multitrack.

The code to support zHPF multitrack can be loaded online. The state of the TRANSPORT MODE/HPF on the Control Unit when the zHPF multitrack code is loaded will determine if the accessing host will use the multitrack operations. There are two states to be considered as follows:

- The first state is when zHPF is not already enabled. If the zHPF multitrack code is loaded on a system that does not have TRANSPORT MODE/HPF enabled (that is, the IMPL flag is set to NO), no action is performed since zHPF multitrack support requires that the base zHPF support has to be enabled. If, however, the customer subsequently enables TRANSPORT MODE/HPF, the control unit will then report support for both the base zHPF function and zHPF multitrack.

- The second state is when zHPF is already enabled. If the zHPF multitrack code is loaded on a system that already has Transport Mode/HPF enabled, the control unit will generate a state change interrupt for the lowest online device in each Logical Control Unit (LCU), which in turn will cause the host to re-issue the “inquiry” commands, including the Read Features Code command. The host will then detect that the multitrack operations are supported and will begin issuing zHPF multitrack requests.

Data at Rest Encryption

Enginuity 5875 provides support for Symmetrix Data at Rest Encryption (Data Encryption) on all drive types supported by the Symmetrix VMAX system. The Data Encryption feature is available for new VMAX systems shipping with Enginuity 5875. It is not available as an upgrade option for existing VMAX systems (installed prior to the availability of Enginuity 5875), nor can it be made available through the RPQ process. This feature makes use of some special new hardware at the device adapter (DA) level. Further, this capability at the DA level to provide encryption for all drives controlled by that director represents a competitive advantage since other enterprise-class subsystems require that special drives be used to achieve encryption.

There are no user controls to enable or disable Data Encryption in a VMAX.

DARE adds Data Encryption capability to the back end of the VMAX, and adds encryption key management services to the service processor. Key management is provided by the RSA® Key Manager (RKM) “lite” version that can be installed on the VMAX service processor by the Enginuity installer program. This new functionality for the service processor consists of the RKM client and embedded server software from RSA. This is illustrated in Figure 1.
Data Encryption key lifecycle management incorporates a number of concepts aimed at simplifying, while still maintaining, a sufficiently robust key management infrastructure. All keys used within a subsystem are specific to an individual drive or that subsystem only. During the installation of the subsystem, the array key encryption key is generated. As drives are added or replaced, new Data Encryption keys are generated. After successful drive replacements, the old keys are destroyed both in the subsystem configuration and also in the key manager. The Symmtrix audit log records all key management events.

New user interfaces provided with the Data at Rest Encryption feature include inlines to query or update the encryption-related state in the hardware, I/O structures, and system configuration areas; new error and event trace messages (specific to Data at Rest Encryption); new audit log entries for capturing key management events; and Symmwin debugging tools to query or update key states in the RKM database.

The status of DARE can be easily checked by using the DEVICE DISPLAY SUMMARY or DEVICE DISPLAY CNTRL (nnnnnnn-nnnnn) command to display whether DARE is ON or OFF, as shown in Figure 2.
Disk Compare

The Disk Compare utility is invaluable in its ability to compare data on allocated tracks at the physical level for pairs of logical disk volumes. It has been enhanced to support comparison of devices multiple hops away in an SRDF configuration. Disk Compare is implemented as a batch process and uses the z/OS device number of the respective devices being compared, the number of pairs of devices to compare, the number of cylinders to be validated, and a cylinder skip option that defines the number of cylinders to skip, plus one cylinder to process.

Electronic license management

Electronic license management builds on the Symmetrix feature registration table introduced in Enginuity 5874 that was responsible for providing an indication of enablement for each feature along with maintaining a usage count. Currently, the Key Feature Interface (KFI) is invoked to check the feature’s enablement state and it records the usage count. However, requests to utilize disabled features were not rejected.
With Enginuity 5875 and later (and Mainframe Enablers 7.2), disabled features are rejected and access to the feature is based on the entitlements specified either in the Activation File on the Symmetrix or within the SCF parameters. All relevant information is stored in the Symmetrix feature registration table mentioned earlier. EzSM will display the usage reports generated on the Symmetrix either daily or on demand. Figure 3 illustrates a sampling of features and their relevant ELM properties.

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Act</th>
<th>Type</th>
<th>Licensed</th>
<th>Capacity</th>
<th>Expiration Date</th>
<th>Install Date</th>
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<tr>
<td>SYMM_ARRAY</td>
<td>P-IND</td>
<td>R-TB-non-SATA</td>
<td>100</td>
<td>R-TB-SATA</td>
<td>-</td>
<td>4 Aug 2010</td>
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<tr>
<td>SYMM_WEBCLONE</td>
<td>P-IND</td>
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<td>-</td>
<td>R-TB-SATA</td>
<td>-</td>
<td>4 Aug 2010</td>
</tr>
<tr>
<td>SYMM_SRD2_S</td>
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<td>-</td>
<td>R-TB-SATA</td>
<td>-</td>
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<tr>
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<td>4 Aug 2010</td>
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<td>SYMM_OCP</td>
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<td>R-TB-non-SATA</td>
<td>100</td>
<td>R-TB-SATA</td>
<td>-</td>
<td>4 Aug 2010</td>
</tr>
<tr>
<td>SYMM_SPC</td>
<td>P-IND</td>
<td>R-TB-non-SATA</td>
<td>100</td>
<td>R-TB-SATA</td>
<td>-</td>
<td>4 Aug 2010</td>
</tr>
<tr>
<td>SYMM_OPTIMIZER</td>
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<td>R-TB-non-SATA</td>
<td>100</td>
<td>R-TB-SATA</td>
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<td>4 Aug 2010</td>
</tr>
<tr>
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<td>-</td>
<td>4 Aug 2010</td>
</tr>
<tr>
<td>SYMM_FAST</td>
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<td>C-TB</td>
<td>500</td>
<td>R-TB-SATA</td>
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<td>4 Aug 2010</td>
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<tr>
<td>SYMM_FAST_VP</td>
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<td>C-TB</td>
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<td>-</td>
<td>4 Aug 2010</td>
</tr>
<tr>
<td>SYMM_SRD1</td>
<td>P-IND</td>
<td>C-TB</td>
<td>100</td>
<td>R-TB-SATA</td>
<td>-</td>
<td>4 Aug 2010</td>
</tr>
</tbody>
</table>

Figure 3. Electronic license management display

**Thin pool management**

With Mainframe Enablers 7.0, SCF permitted the user to create thin FBA pools that could then be populated with FBA data devices; it also allowed the removal of any or all of the devices as well as the deletion of the pool itself. Supported by Enginuity 5875, ResourcePak® Base is enhanced to provide management of thin pools through the use of the BIND, UNBIND, and RENAME functions. However, only thin FBA devices and pools are supported for BIND and UNBIND. CKD devices and corresponding pool management are not provided at this time.

**Consistent dataset snap**

The consistent dataset snap capability for z/OS, offered through Enginuity 5875, is unique to EMC. Consistent dataset snap allows the user to obtain a dependent write consistent image of multiple datasets using the TimeFinder®/Clone MF Snap Facility “SNAP DATASET” function.

Currently, inter-dataset consistency is only achievable by requesting an exclusive enqueue on the source datasets, which is very impractical in production.
environments; the larger the production environment is, the more impractical it becomes. Further, this approach does not provide for cross sysplex consistency, another consideration in very large environments.

Other factors prohibiting this function up to now were that the SNAP DATASET approach operated on a single dataset at a time and the Enginuity extent snap took far too long to be executed under an Enginuity Consistency Assist (ECA) window. A further complication was that the extent snap did not allow for the separation of the establish and activate phases of the snap of a dataset (but was allowed for a full volume); this was critically needed and has now been provided.

Thus, the new consistent extent snap feature of Enginuity 5875 provides the ability to do separate establish and activate extent level snap operations, which in turn results in dataset snap processing on an entire group of datasets such that dependent write consistency is assured across the resulting group of target datasets.

A separate ACTIVATE statement can now follow SNAP DATASET statements and CONSISTENT(YES) is now allowed on ACTIVATE as seen in the following example and documented in more detail in the EMC TimeFinder/Clone Mainframe SNAP Facility Product Guide.

```plaintext
GLOBAL     MAXRC(4) PARALLEL(YES) HOSTCOPYMODE(NONE)
GLOBAL     DEBUG(EXTRA)
*
SNAP DATASET ( SOURCE ( WJWJ.X1F.DD0.MV5300 ) -
  TARGET ( WJMVS9.X1F.DD0.MV5320 ) -
  VOLUME(MV5320 ) -
  REPLACE(Y) -
  REUSE(N) -
  )
*
SNAP DATASET ( SOURCE ( WJWJ.X1F.DD1.MV5301 ) -
  TARGET ( WJMVS9.X1F.DD1.MV5321 ) -
  VOLUME(MV5321 ) -
  REPLACE(Y) -
  REUSE(N) -
  )
*
ACTIVATE (CONSISTENT(YES))
```

A noteworthy point about consistent dataset snap is that it provides only inter-dataset dependent write consistency; intra-dataset (metadata and data) consistency is not guaranteed at this time. The user must ensure that metadata changes such as additional extents (dataset expansion) do not occur during consistent dataset snap processing.

Further, some consideration should be given to the fact that since the ECA mechanism operates on the volume level, access to other datasets may be affected during that ECA window.
Duplicate snap

Duplicate snap provides the ability to create a point-in-time copy of a previously activated virtual device. This allows the creation of multiple copies of a point-in-time copy. This is illustrated in Figure 4.

![Duplicate VDEV](image)

**Figure 4. Duplicate snap**

This functionality is useful for users who wish to take copies of their production environments and repurpose them for other uses such as single or iterative testing, quality assurance, or other forms of application extensions and development. As a natural course of testing, users may require additional copies of their testing to reflect work done to that point; this is useful for purposes such as backup or for supporting further testing efforts. A major benefit of this feature is that it avoids the need to replicate the full volume (that is, 100 percent additional storage) thereby achieving sizable cost savings while delivering significant flexibility of testing and development.

The maximum number of snap copies produced from a given source set of volumes will continue to be 128; users can perform duplicate snaps up to this limit with the proviso that all of them must originate from the same source. There are new parameters introduced in the "SNAP VOLUME" command syntax. They are SOURCE_VDEV along with a new alias of "TARGET_VDEV" for the "TARGET" parameter. This is shown in the following example:

```
SNAP VOLUME (SOURCE_VDEV(srcvdev) TARGET_VDEV(tgtvdev)
```

Other considerations are that there is a maximum of two duplicate VDEVs per source that are allowed to be in the "ESTABLISHED and INACTIVE" state at any time; once activated up to two more can be established. Also, the termination or re-snap of the original VDEV session is not allowed with the inactive duplicate VDEV.
The restoration of snap copies back to the source, or promotion to a full copy volume is supported; however, restoring a snap copy back to the original source snap is not supported.

This feature requires Mainframe Enablers 7.2 software, and is manageable using Symmetrix Management Console 7.2.

**Simultaneous TimeFinder/Clone**

Simultaneous TimeFinder/Clone is useful in business continuity environments utilizing SRDF/S. To truly understand this feature and its impact on the SRDF/S environment it is important to examine the SRDF/S environment without it first.

Prior to the availability of the Parallel Clone feature any SNAP VOLUME or SNAP DATASET operations to SRDF/S R1 volumes would result in copy (data) operations across the SRDF/S link. This could require sizable outlays of link bandwidth depending on the magnitude and duration of the copy operations. Also, data on the secondary Symmetrix was not usable until the copy was completed across the links. This is illustrated in Figure 5.

![Figure 5. SRDF/S environment without Parallel Clone](image)

The Simultaneous TimeFinder/Clone feature of Enginuity 5875 allows the SNAP VOLUME or SNAP DATASET operations to SRDF/S R1 volumes (primary Symmetrix) to result in independent simultaneous snap operations of the corresponding R2 volumes (secondary Symmetrix) such that no data is transmitted across the SRDF/S links since the command operation is duplicated on the secondary Symmetrix. This is illustrated in Figure 6.
Most importantly, the Simultaneous TimeFinder/Clone feature helps ensure that the data state of the R1 is always identical to the data state of the R2 and current data is available on all times on both sides.

Simultaneous TimeFinder/Clone is similar in function to the IBM Remote Pair FlashCopy, which is sometimes referred to as Preserve Mirror; for clarification, Preserve Mirror is actually the z/OS software function that utilizes IBM’s Remote Pair FlashCopy. The Simultaneous TimeFinder/Clone feature is not a compatible implementation of IBM Remote Pair FlashCopy; that remains as a future Enginuity objective.

Simultaneous TimeFinder/Clone is implemented through the introduction of the new parameter PARALLEL_CLONE (YES | NO) specifiable on the GLOBAL, SNAP DATASET, and SNAP VOLUME commands. PARALLEL_CLONE is also available as a site option.

The following example illustrates the keyword specifications mentioned above:

/***********************************************************
//*    SOURCE:  5420 - 542F R1     R2 - 8160 -816F         *
//*    TARGET:  5430 - 5430 R1     R2 - 8170 -817F          *
//**********************************************************
*
GLOBAL MAXRC(4) CHKO(NO) DEBUG(EXTRA)
GLOBAL PARALLEL_CLONE(YES) CHECKBCVHOLDSTATUS(NO)
*
SNAP VOLUME  (SOURCE (UNIT (5420-542F))                        -
   TARGET (UNIT (  5430-543F))                                        -
   COPYVOLID(NO)                                                         -
   FREESPACE(YES)                                                           -
   REPLACE (YES)                                                              -
   CONDITIONVOLUME(ALL )                                         -
   )
*

ACTIVATE(CONSISTENT(YES) MESSAGES(DISPLAY))
Simultaneous TimeFinder/Clone requires Enginuity 5875 on the Symmetrix subsystems on both sides of the link. It also requires that the R2s of the R1 source and target snap volumes be in the same Symmetrix (that is, no SRDF fan out).

The specification of PARALLEL_CLONE should not be confused with the existing PARALLEL parameter (that is, PARALLEL | PAR(YES | NO)) on the GLOBAL statement for enabling or disabling multitasking. It is also different from the existing PARALLEL SNAP feature that allows two independent snap operations in the same or different Symmetrix subsystems driven by two independent SNAP DATASET commands specifying the same source dataset name, but different target dataset names.

Simultaneous TimeFinder/Clone is not supported on Cascaded SRDF devices. There are some dynamic SRDF operations blocked on Simultaneous TimeFinder/Clone devices: Delete and Half Delete, Swap and Half Swap, Move Group and Half Move Group.

**Concurrent SRDF/Asynchronous**

Concurrent SRDF/A offers the ability to asynchronously replicate from a single production Symmetrix subsystem to two unique, remote Symmetrix subsystems. Specifically it enables both legs of an R11 (source/primary Symmetrix) to participate in two SRDF/A relationships. The cycle switch for each leg is done independently, although Multi-Session Consistency (MSC) can be used to achieve a coordinated cycle switch between the two legs. Further, in non-MSC implementations, the cycle times may be different. The primary site must be running Enginuity 5875.

This approach has been shown to minimize some of the performance impact to production applications in multisite SRDF environments. Further, it provides the users of existing Concurrent SRDF/S and SRDF/A implementations the ability to change the synchronous mode operation to asynchronous mode during peak workload times so as to minimize the impact of SRDF/S round trip response time to the applications; the ability to accomplish this ensures that the host applications will not be gated by the synchronous performance of the subsystems and network alike. The mode change can be executed on one or both of the SRDF legs. Given the flexibility of this feature offering, users may now choose to "stretch out" the distance of one of the SRDF/A legs to achieve additional configuration resilience.

**Copy QoS**

Enginuity 5875 provides more granular controls for Copy QoS, which yield marked improvements over prior level of controls. In essence, it has been re-implemented to work with Request Based Copy and to address other requirements. This is appealing for those environments that engage in a lot of local and remote replication.

Currently, the QOSGET and QOSSET commands are used to display and set device copy priorities for logical volumes. The Copy QoS enhancement now provides the ability to set the copy priority for each device. It provides the ability to adjust the copy priority for devices in both directions (that is, to speed up or slow down the default
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behavior depending on the user's priorities). When a low-priority copy device that has a high QoS value is set to perform a copy, the copy scheduler will dynamically increase the copy rate if the subsystem is relatively idle. QoS acts independently on each copy, even when the same source device is being used for multiple concurrent copies. Also, QoS has the ability to temporarily stop a copy already in progress.

The supported copy types are RDFP(#), SERP(#), SNPP(#), and VLUN(#), where # is a number that indicates the priority between 0 and 16. There are certain compatibility changes as a result of this enhancement. For the OSGET/QOSSET command, the BCVP, SCRP, LRU, and LRUNAME parameters are not supported in Enginuity 5875. Also, for the QOSSET command BCVP, SCRP, and LRUNAME are now ignored and generate a message. VLUN is not supported and will produce an error. Figure 7 illustrates the new and old display formats for QOSGET.

![New DISPDEV/QOSGET(5X75) display: Symmetrix Quality of Service Display Copy Priority Request](image1)

![Old QOSGET display: Symmetrix Quality of Service Get Settings Request](image2)

**Figure 7. New and old QOSGET displays**

**TimeFinder/Snap off SRDF/A R2**

Prior to Enginuity 5875, active TimeFinder/Snap and TimeFinder/Clone sessions running off active SRDF/A R2s would sometimes cause SRDF/A to drop. TimeFinder/Clone was supported with the use of pre-copy. However, TimeFinder/Snap off SRDF/A R2 was blocked by TimeFinder/Clone MSF. The new TimeFinder/Snap off SRDF/A R2 function in Enginuity 5875 removes the TimeFinder/Snap block and it is now enabled via a new "device pacing" feature.

This feature works only for SRDF/A R2 volumes using TimeFinder. It detects the active TimeFinder sessions on the R2 volumes and recognizes the slowest volume’s restore rate. It can delay the host writes at the volume level to prevent cache overflow and hence prevent SRDF/A drops. The TimeFinder/Clone MSF will check for enabled device pacing before allowing VDEV to be established. Enginuity 5875 is required on
both the primary and secondary Symmetrix subsystems (both sides of the link). Cascaded SRDF (R21 to R2) is not supported.

Device pacing and group pacing can coexist independently and are monitored and armed upon certain criteria being met. Device pacing arms if the R2 restore rate is less than the arrival rate and TimeFinder is active on the volume; only affected volumes are paced. Group pacing arms if the link rate is less than the host I/O rate and all volumes in the group are paced. Pacing exemption specified through the NOGPACE option is a new feature that is applicable to group pacing and it allows individual volumes to be exempted from group pacing. The SRDF Host Component specifies new device level write pacing controls on the SC SRDFA_WP command.

**Extended Remote Copy (XRC) Enhanced Multiple Reader**

Compatible z/OS Global Mirror Multiple Reader (Multi Reader) is an IBM-compatible enhancement where the updates for a given set of volumes are spread evenly across multiple cache sidefiles and a separate host reader is provided for each sidefile, thereby enabling more efficient parallel offloading of updates to the set of volumes by the System Data Mover (SDM). It also provides the capability to offload record sets from cache sidefiles by using parallel access volumes (PAVs). PAVs are discussed in detail in the white papers *New Features in EMC Enginuity 5773 for Symmetrix Mainframe Environments* and *Exploiting HyperPAV in EMC Symmetrix DMX Environments*.

Sidefiles consume cache and can build up to high levels when the SDM read rate cannot keep pace with the production system write rate; uncorrected, this can result in a variety of pacing operations including write pacing or suspension of the XRC microcode sessions. In extreme cases, this can result in Long Busy conditions presented to the production systems.

Multi Reader sessions are similar to the original single-reader session with a difference that devices can belong to any and all of the related sessions (as opposed to only one single-reader XRC session). The Enginuity 5875 implementation supports one primary and 13 auxiliary sessions.

Each Multi Reader session has its own sidefile, with its own set of sequence numbers, very much like a single-reader session. A device must belong to a particular Multi Reader session in order to have entries in that session’s sidefile, just like for a single-reader session. A single-reader session can be converted to a Multi Reader primary session by “re-registering” the session ID as a multi-reader session; the existing sidefile entries are preserved. Also, a Multi Reader primary session can be converted to a single-reader session as long as there are no auxiliary sessions associated with the primary session and this is accomplished by “re-registering” the session ID as a single-reader session. Further, a Multi Reader auxiliary session can be converted into a Multi Reader primary session by “re-registering” the session ID as a primary session.
Any device address in the Logical Subsystem (LSS) can now be used to read from a session’s sidefiles. Reading can be done from an alias address including HyperPAV (HPAV). Only one read at a time can be done from each sidefile.

**PPRC/XRC Incremental Resync**

PPRC/XRC Incremental Resync provides a zero data loss distance asynchronous data replication solution within IBM’s GDPS MzGM service offering. GDPS MzGM is required for this functionality. Typically when customers use an asynchronous replication product such as XRC they would expect to incur some data loss at the time of a disaster; this is just the true nature of asynchronous replication. By merging synchronous replication (PPRC) with asynchronous replication (XRC) this data loss is eliminated. This feature requires Enginuity 5875 at both the primary and secondary PPRC Symmetrix subsystems.

Figure 8 illustrates the necessary configuration to accomplish this — a local production site A with volumes set up as PPRC primaries replicated to another set of volumes (secondaries) at the secondary site B. Also, both the PPRC primaries in Site A and the PPRC secondaries in Site B are configured as XRC primaries for the same set of XRC secondaries in Site C. Further, the XRC session from Site A to Site C is active, while the XRC session from Site B to Site C is suspended.

![Figure 8. Incremental Resync environment](image)

**Instant VTOC (iVTOC) for CKD**

iVTOC has the potential to offer performance gains versus legacy VTOC (beyond the first access). iVTOC significantly shortens the time it takes to VTOC a device; it is a
table-only VTOC that formats the tables in global memory without going to disk. IVTOC is an alternative to the existing VTOC system and offers time savings and convenience among its benefits. It is useful in areas that include online dynamic configuration changes such as “device adds”; significant reduction of the time taken to install a new Symmetrix VMAX subsystem since a full machine VTOC is required; and Extended Address Volume (EAV) environments due to the very large device sizes (up to 250,000 cylinders at present, but getting larger).

IVTOC involves marking tables as pending destage and allowing the destage to be done later; this replaces the old method of writing zeros to the disk, which was very time-consuming. With IVTOC, if the track is written to (in cache) by the host before it is destaged, the table in cache is reformatted so that the write is accepted.

**SRDF software compression**

Enginuity 5875 introduces software compression as a new function. This is accomplished by Enginuity running a software compression algorithm on the remote adapter (RA) for SRDF/A I/Os; it applies at the group level to both FC and GigE forms of I/Os. This feature requires both R1 and R2 Symmetrix arrays to be running Enginuity 5874.207 or later. This software compression is separate from, and works independently of, the existing hardware data compression that was introduced with an earlier level of Enginuity; that hardware-level data compression applied only to GigE RDF. Only the R1-side software compression settings are active on the RDF session. The new functionality is controlled by the new SC SRDF_CMPR command, which provides for two new command actions (ACT - activate, and DEACT - deactivate). The command syntax is as follows:

```
#SC SRDF_CMPR
 ,LCL(cuu,rdfgroup#)
 ,RMT(cuu,mhlist,rdfgroup#)
 ,action
 ,CQNAME=cqname
 ,CQNAME=(cqname,queue-option)
```

**Conclusion**

Enginuity 5875 builds on the previous levels of Enginuity by delivering significant new software functionality that supports the sophisticated hardware capabilities of Symmetrix VMAX, thereby improving performance and lowering operational cost while simplifying subsystem management and boosting data availability locally and remotely.
References

The following documents are available from EMC:

- *EMC TimeFinder/Clone Mainframe SNAP Facility Product Guide* (part number 300-000-969)
- *Exploiting HyperPAV in EMC Symmetrix DMX Environments*, white paper (P/N h4278), March 2008 by Anthony Mungal
- *New Features in EMC Enginuity 5773 for Symmetrix Mainframe Environments*, white paper (P/N h4281), June 2008 by Anthony Mungal
- *EMC Enginuity 5874 Enhancements for Symmetrix VMAX Mainframe Environments*, white paper (P/N h6789), November 2010 by Anthony Mungal

The following documents are available from IBM:

- "The Importance of Being Consistent; DB2 for z/OS and Copy Services for IBM System z", In Proceedings of GUIDE SHARE Europe, September 2010 by F. Dubois
- APAR OA28184,"New Function Preserve Mirror FlashCopy, IBM Remote Pair FlashCopy ***Doc Continuation of OA24814***", April 2009
- "Using DFSMSdss and System Data Mover in a FlashCopy Environment", In Proceedings of SHARE, Boston, MA, August 2009 by J. Suarez