

 #SHAREorg



IEBCOPY – Teaching an Old Dog Newer Tricks

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Session 12980



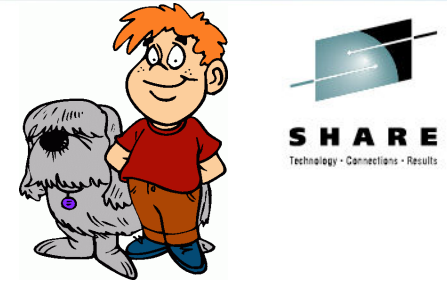
Agenda

- Basics
- Review z/OS® V1R13 Enhancements
- What's New with z/OS® V2.1
- Enhanced Functions Offering

IEBCOPY Basics

• Typical Tasks

- Make a copy of a PDS or PDSE
 - Select or exclude specific members to be copied, loaded, or unloaded
 - Rename selected members
- Convert a PDS to PDSE or PDSE to PDS
- Merge PDSs or PDSEs
- Replace members of a PDS or PDSE
- Create a sequential form of a PDS or PDSE for backup (aka load/unload)
 - Load/unload one or more members from a PDS or PDSE into/from a PS data set
- Compress a PDS in place



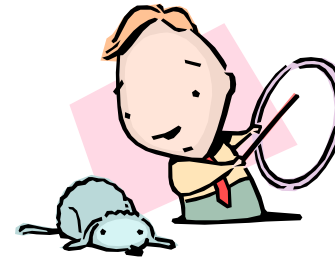
• Typical Tasks

- Copy to or from a PDSE data set, a member and its aliases together as a group (aka COPYGRP)
- Copy and reblock load modules
- Convert load modules to program objects or the reverse

• Note:

- PDSs contain data members, load modules or a mix
- PDSEs contain data members OR program objects

Recent Enhancements



IEBCOPY – V1R13: APF Authorization

- APF Authorization
 - Previously, IEBCOPY used channel programming which require it to be run from an authorized library
 - If another program called IEBCOPY, that program also had to be APF-authorized
 - Created a potential system integrity exposure by requiring existing programs to get authorization although they were not designed with system integrity in mind
 - **Enhancement:** IEBCOPY removed the requirement for APF authorization
 - If your program calls IEBCOPY, you probably can remove APF authorization from your program, making it safer

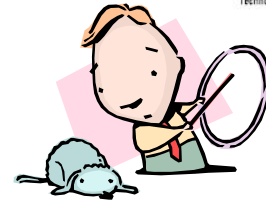
? Why it Matters: Improves usability and system integrity is less exposed

IEBCOPY – V1R13: Performance

- IEBCOPY Performance
 - Previously, IEBCOPY
 - Used older channel programming techniques which can impact performance
 - Used 24-bit addressing which can inhibit use of virtual storage
 - **Enhancements:** Improved channel programs and use of 31-bit buffers for PDS read operations
 - You did not need to anything to get the improved performance
 - **? Why it Matters:** PDS copy performance is enhanced in some cases; we measured elapsed time reductions from 19-70%*

* Note: Performance improvements are based on internal IBM laboratory tests. Your results will vary. IEBCOPY improvement will depend on the amount of data being copied, the record format, the record length, and the block size.

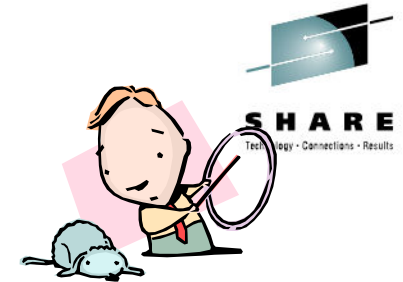
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IEBCOPY – Performance Results

- Performance Methodology
 - Generate data in PDS source data sets with several variations in block and record sizes.
 - Delete half of the data throughout, creating “holey” PDSs to simulate customer-like workload with JCL members deleted from the PDS
 - Read the PDSs in single stream and then concurrently from the same volume
 - *Copy a PDS to a PDS*
 - *Copy a PDS to a sequential data set*
 - *Compress a PDS*
 - *Copy PDS loadlib to PDS loadlib*
 - *Copy PDS loadlib to a sequential data set*
 - *Compress a PDS loadlib*
- The next few charts are just a sample of performance runs. More are available.
- Note: Performance improvements are based on internal IBM laboratory tests. Your results will vary. IEBCOPY improvement will depend on the amount of data being copied, the record format, the record length, and the block size.

IEBCOPY – Performance Results



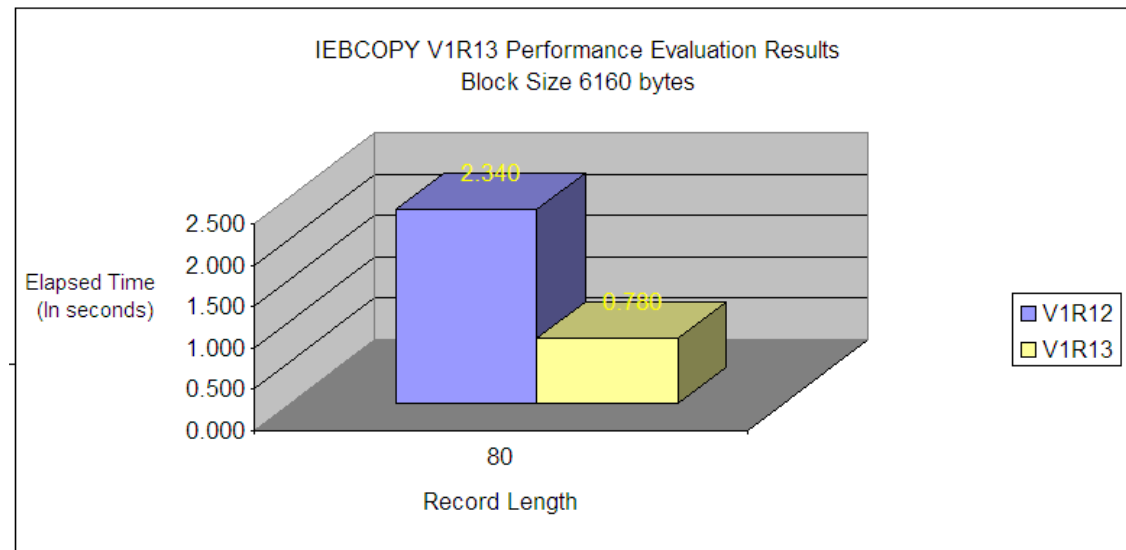
Copy PDS to PDS Testing results Block size 6160 Format (FB)

- Copy PDS to PDS
 - Copy 1500 members from PDS source to PDS target
 - Record Format (FB)
 - Block size (6160)

★ ~67% throughput improvement

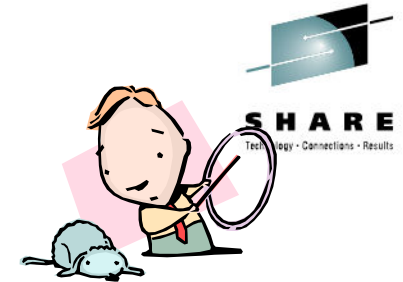
Elapsed Time measurements

| LRECL | V1R12 | V1R13 | Delta (%) |
|-------|-------|-------|-----------|
| 80 | 2.340 | 0.780 | -66.67 |
| 132 | * | * | --- |
| 4096 | * | * | --- |



Note: * .- Record length is inconsistent with block size for this record format. Test not executed for this variation

IEBCOPY – Performance Results

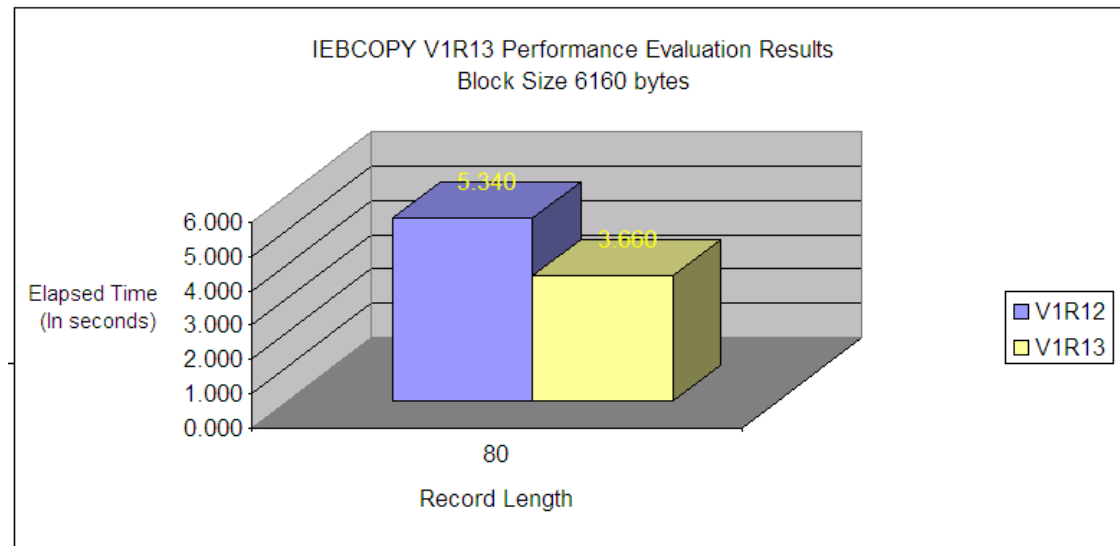


Copy PDS to SEQ Testing results
Block size 6160 Bytes Format (FB)

- Copy PDS to SEQ
 - Copy 1500 members from PDS source to SEQ target
 - Record Format (FB)
 - Block size (6160)
- ★ ~31% throughput improvement

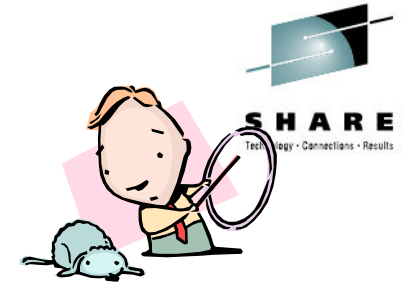
Elapsed Time measurements

| LRECL | V1R12 | V1R13 | Delta (%) |
|-------|-------|-------|-----------|
| 80 | 5.340 | 3.660 | -31.46 |
| 132 | * | * | --- |
| 4096 | * | * | --- |



Note: * .- Record length is inconsistent with block size for this record format. Test not executed for this variation

IEBCOPY – Performance Results

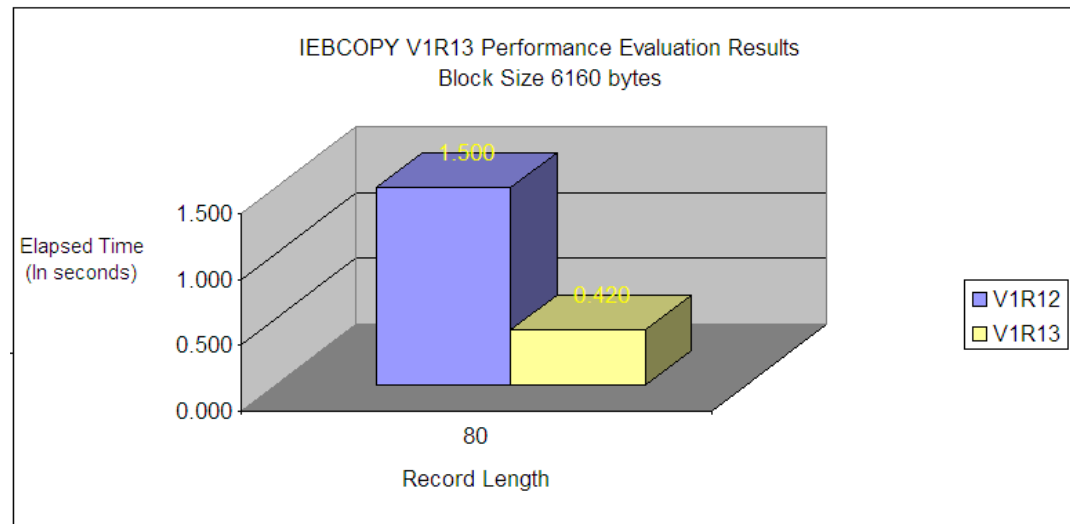


- PDS Compress
 - Deleted 500 members from target PDS prior to compress
 - Prior to delete, target PDS had 1500 members
 - **Record Format (FB)**
 - **Block size (6160)**
- ★ ~72% throughput improvement

Compress PDS Testing results
Block size 6160 Format (FB)

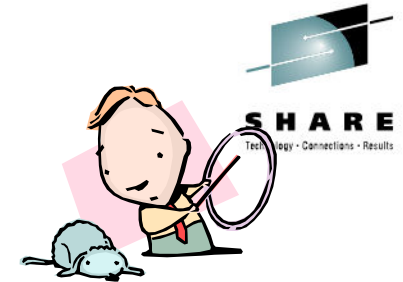
Elapsed Time measurements

| LRECL | V1R12 | V1R13 | Delta (%) |
|-------|-------|-------|-----------|
| 80 | 1.500 | 0.420 | -72.00 |
| 132 | * | * | --- |
| 4096 | * | * | --- |



Note: * .- Record length is inconsistent with block size for this record format. Test not executed for this variation

IEBCOPY – Performance Results



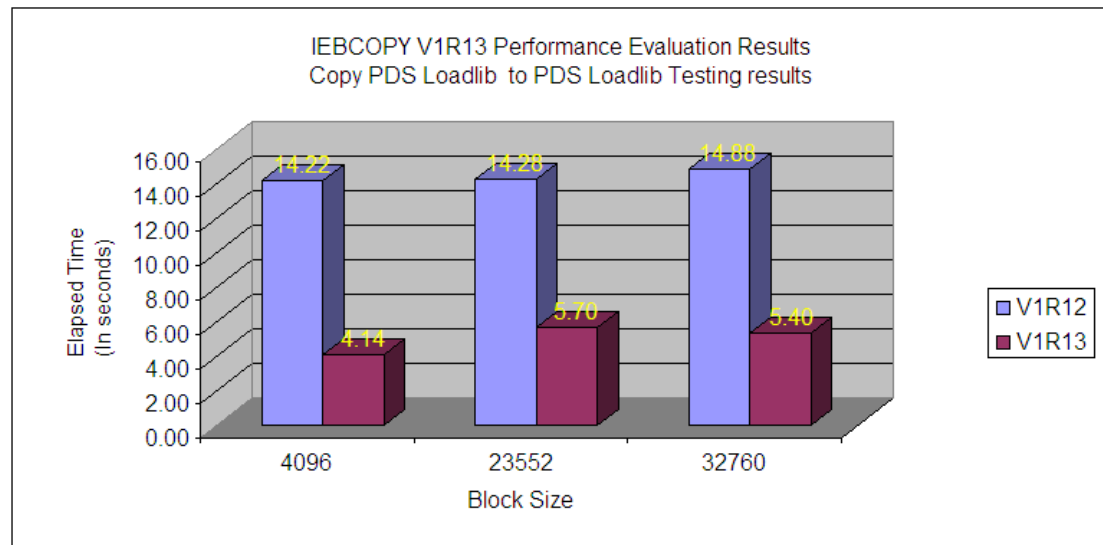
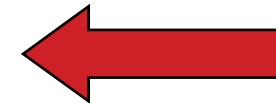
- PDS Loadlib to PDS Loadlib
 - Copy 1000 members from PDS source's Loadlib to PDS target's Loadlib
 - **Record Format (U)**
 - **LRECL(0)**

★ ~60-70% throughput improvement

Copy PDS Loadlib to PDS Loadlib Testing results
LRECL=0 Format (U)

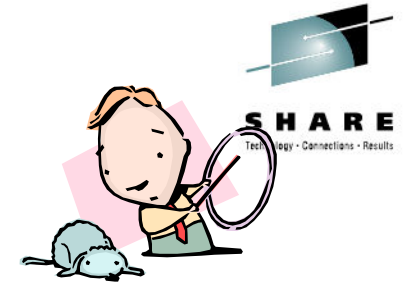
Elapsed Time measurements

| BLKSIZE | V1R12 | V1R13 | Delta (%) |
|---------|-------|-------|-----------|
| 4096 | 14.22 | 4.14 | -70.89 |
| 23552 | 14.28 | 5.70 | -60.08 |
| 32760 | 14.88 | 5.40 | -63.71 |



* Note: Performance improvements are based on internal IBM laboratory tests. Your results will vary. IEBCOPY improvement will depend on the amount of data being copied, the record format, the record length, and the block size.

IEBCOPY – Performance Results



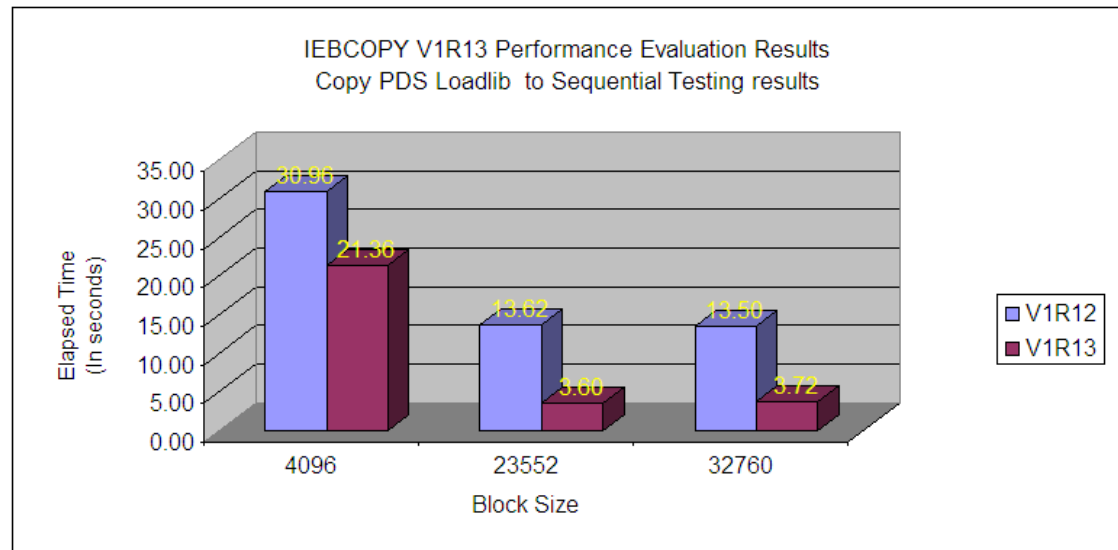
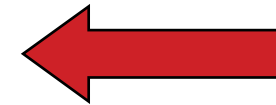
- PDS Loadlib to SEQ Loadlib
 - Copy 1000 members from PDS source's Loadlib to SEQ target's Loadlib
 - **Record Format (U)**
 - **LRECL(0)**

★ ~31-73% throughput improvement

Copy PDS Loadlib to SEQ Testing results
LRECL=0 Format (U)

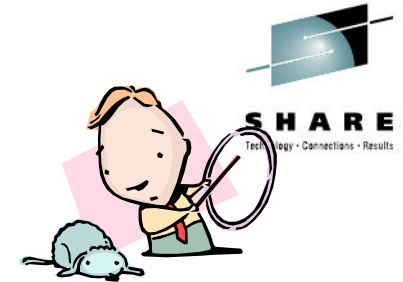
Elapsed Time measurements

| BLKSIZE | V1R12 | V1R13 | Delta (%) |
|---------|-------|-------|-----------|
| 4096 | 30.96 | 21.36 | -31.01 |
| 23552 | 13.62 | 3.60 | -73.57 |
| 32760 | 13.50 | 3.72 | -72.44 |



* Note: Performance improvements are based on internal IBM laboratory tests. Your results will vary. IEBCOPY improvement will depend on the amount of data being copied, the record format, the record length, and the block size.

IEBCOPY – Performance Results



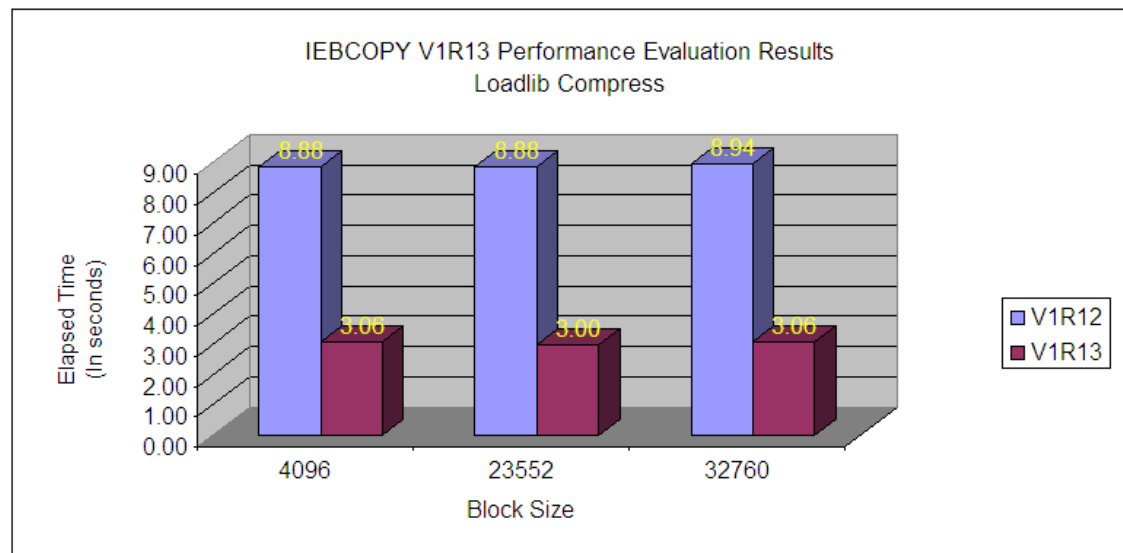
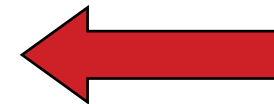
- Loadlib Compress
 - Deleted 500 members from the target PDS prior to compress
 - Prior to delete, target PDS had 500 members
 - **Record Format (U)**
 - **LRECL(0)**

★ ~65-66% throughput improvement

Loadlib Compress Testing results LRECL=0 Format (U)

Elapsed Time measurements

| BLKSIZE | V1R12 | V1R13 | Delta (%) |
|---------|-------|-------|-----------|
| 4096 | 8.88 | 3.06 | -65.54 |
| 23552 | 8.88 | 3.00 | -66.22 |
| 32760 | 8.94 | 3.06 | -65.77 |



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 * Note: Performance improvements are based on internal IBM laboratory tests. Your results will vary. IEBCOPY improvement will depend on the amount of data being copied, the record format, the record length, and the block size.

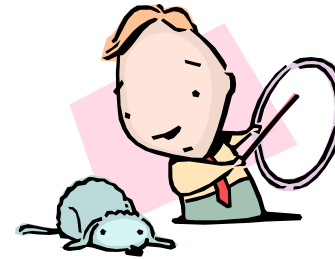
IEBCOPY – V1R13 Migration Assistance

- To assist in migration to R13
 - An old level of IEBCOPY was made available in SYS1.LINKLIB by the name of IEBCOPYO (for “OLD”).
 - IEBCOPYO continues to have the APF authorization requirement.

? Why it Matters: Provided a fallback mechanism

 **Note: It will not be shipped in V2.1**

New Function



IEBCOPY – Requirement

| Requirement Area | Brief Description |
|------------------|--|
| COPYGRP | <ul style="list-style-type: none"> •Customer would like to be able to copy the aliases of load modules during IEBCOPY function. They would like to be able to specify an ALIAS keyword when specifying the main load module name in the IEBCOPY job. That way, they can more easily copy IBM load modules which can have up to a dozen alias names. •When using IEBCOPY to copy PDS LOAD MODULES, any aliases have to be specified explicitly. If they are not they do not get included in the copy. •IEBCOPY COPYMOD function no longer automatically pulls in aliases. This is inefficient as it requires extra legwork to identify module aliases and include them in the Select list. Functionality should be restored to IEBCOPY COPYMOD, or IEBCOPY COPYGRP should allow a copy of PDS to PDS, as this function does automatically pull in the aliases. |

IEBCOPY – Prior to V2.1

- COPYGRP
 - Recommended when copying program objects and their aliases from or to a PDSE
 - Ensures that any aliases which are longer than 8 characters are also copied along with their member
 - Valid when either the input, output or both data sets are PDSE
 - PDSE to PDSE
 - PDSE to PDS
 - PDS to PDSE
 - Can also be used for unloading or loading groups:
 - PDSE to PS
 - PS to PDSE
 - The EXCLUDE statement is not supported

Restriction: Function not supported for PDS to PDS. It is treated as a COPY operation.

IEBCOPY – New in V2.1: COPYGROUP

- New COPYGROUP statement
 - Designed to copy members and all aliases for any combination of PDS and PDSE data sets.
 - A superset of the existing COPYGRP function.
 - Use the COPYGRP or COPYGROUP statement to begin a *group* copy, unload, or load. A *group* consists of a member and all of its aliases. COPYGRP or COPYGROUP treats the group as a single entity.

- The syntax of the COPYGROUP statement:

| Label | Statement | Parameters |
|----------------------|------------------|---|
| <code>[label]</code> | COPYGROUP | OUTDD=DDname ,INDD={DDname ((DDname,R))} ,LIST={YES NO}] |

- To abbreviate a COPYGROUP statement, use CP.

IEBCOPY – COPYGROUP cont

- COPYGROUP can be used to copy a data set when either the input data set or the output data set, or both, are PDS or PDSE:
 - PDSE to PDSE
 - PDSE to PDS
 - PDS to PDSE
 - **PDS to PDS**
- For unloading groups:
 - Using COPYGROUP: PDSE to PS, or **PDS to PS**
- For loading groups:
 - Using COPYGROUP: PS to PDSE, or **PS to PDS**

IEBCOPY – COPYGROUP cont

- When using the COPYGRP or COPYGROUP statement, same rules apply:
 - All aliases in a group will be copied with the member or neither the aliases or the member in a group will be copied.
 - There can be only one INDD per copy operation.
 - You can use the SELECT statement to selectively copy members. Either the member name or an alias can be specified to copy the member and all of its aliases.
 - Do not indicate replace (**R**) on the SELECT statement.
 - The EXCLUDE statement is not supported.
 - Note : An exception is when used with Member Filter Pattern Masking

IEBCOPY – Requirement

| Requirement Area | Brief Description |
|---|---|
| <p>Special Characters / Matching</p> | <ul style="list-style-type: none"> •IEBCOPY's copy member name validation processing should be amended to support special characters in member names. •Member names for IEBCOPY Selection/Exclusion must be fully qualified. We should be able to partially qualify member names (e.g. IST*), instead of entering the complete name. •IEBCOPY should permit specification of members to be copied on the basis of beginning character string. •IEBCOPY to support member level copy for special character member names. |

IEBCOPY – Prior to V2.1

- Copy functions require that member names be fully qualified.

IEBCOPY – New in V2.1: Member Filter Pattern Masking

- COPYGROUP enhanced to support member filter pattern masking
 - You can use SELECT MEMBER name filter pattern masking instead of specifying a full member name.
 - The filter characters asterisk (*) and percent sign (%) provide the member name filtering capability.
 - With SELECT MEMBER name filter pattern masking, all of the members of the input data set that match the filter mask pattern criteria will be selected.
 - If you specify SELECT MEMBER name filter pattern masking, you can also specify EXCLUDE MEMBER name pattern masking. Otherwise, EXCLUDE is not supported with COPYGROUP

IEBCOPY – Member Filter Pattern Masking cont

- The syntax of the SELECT statement is:

| Label | Statement | Parameters |
|------------------|---------------|---|
| [<i>label</i>] | SELECT | MEMBER= (<i>{name1</i> <i>(name1,newname1[,R])</i> <i>(name1,,R)}</i> <i>[,{name2</i> <i>(name2,newname2[,R])</i> <i>(name2,,R)}</i>] <i>[,...]</i>) |

- where:
 - MEMBER** specifies the members to be selected from the input data set.

When the COPYGROUP statement is used, the member name can either identify a specific member to be processed, or a member name pattern mask where multiple names may meet the name pattern criteria. Member name pattern masking cannot be used with *newname*.

IEBCOPY – Member Filter Pattern Masking cont



- The MEMBER sub parameter of the SELECT and EXCLUDE statements will be enhanced to accept the “*” Substituent Character, and the '%' Filter Character for the primary member names for COPYGROUP.
 - A common filter substituent character (“*”) indicates part of the data for which a match is not required
 - A Filter Character (“%”) indicates that any one data character in the same relative position is a match.

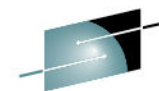
IEBCOPY – Member Filter Pattern Masking cont

- IEBCOPY's SELECT MEMBER and EXCLUDE MEMBER interface is subject to the following checks:
 - The pattern must be part of a COPYGROUP operation.
 - The pattern must be part of a SELECT and EXCLUDE statement.
 - The pattern must not be part of a member pair specifying an 'R' option.
 - The pattern can not be specified with SELECT MEMBER=(oldname,newname)
 - Filtering will only be performed with primary member names.
 - The pattern must be at least 1 character, but cannot be more than 8 characters in length.
 - Asterisk (*) or percent (%) are filter control characters. Notes:
 - One or more periods ('.') will not be accepted as valid characters in member name patterns
 - Member names will continue to support only the following characters: A-Z, 0-9, or \$, #, @, _ and {
 - Two or more consecutive Substituent standing alone ('**') will not be accepted as a valid member name pattern.

IEBCOPY – Member Filter Pattern Masking cont



- When EXCLUDE MEMBER pattern masking is specified, the members excluded from the COPYGROUP operation will be a subset of those members that were selected for inclusion by the SELECT MEMBER pattern mask or masks.



IEBCOPY – Member Filter Pattern Masking cont

| Member name pattern | Description | Example names that would match | Example names that would NOT Match |
|---------------------|---|--------------------------------|------------------------------------|
| * | Any member name | ABC, A12#\$F | None |
| CD* | Member names starting with 'CD' | CDEFGH | ABCD |
| *CD | Member names ending with 'CD' | ABCD | CDEFGH |
| CD% | Three-character member names starting with 'CD' | CD\$ | CD, CDEFG |
| %CD | Member names with second character 'C' and third character 'D' | BCDE, \$CD | CD, CDEFG |
| %CD* | Member names with second character 'C' and third character 'D' | BCD, BCDE, \$CD | BBCDE, CD |
| *CD% | Member names with second to last character 'D' and third to last character 'C' | CDE, BCDE, BBCDE | CD |
| *AB%C* | Member names that have the substring 'AB', followed by any one character, followed by the substring 'C' | ABKC, KKABKCKK | ABC |
| % | Any one-character member name | A, B, C | ABC |
| ** | Not a valid member name pattern | Not Applicable | Not Applicable |



IEBCOPY – New in V2.1: Performance

- IEBCOPY Performance
 - IEBCOPY
 - Uses older channel programming techniques which can impact performance
 - Uses 24-bit addressing which can inhibit use of virtual storage
 - **Enhancements:** Improved channel programs and use of 31-bit buffers for PDS write operations
- **? Why it Matters:** Potential performance improvements

* Note: Performance improvements are based on internal IBM laboratory tests. Your results will vary. IEBCOPY improvement will depend on the amount of data being copied, the record format, the record length, and the block size.

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IEBCOPY – Publications



- Where to Find More Information
 - For detailed information on IEBCOPY and how to invoke it, refer to the following publications
 - z/OS DFSMSdfp Utilities (SC26-7414-07)
 - z/OS DFSMS Using Data Sets (SC26-7410-10)
 - IBM Redbook - Partitioned Data Set Extended Usage Guide
 - <http://www.redbooks.ibm.com/abstracts/sg246106.html?Open>

IEBCOPY – Outstanding Requirements



IEBCOPY Outstanding Requirements

| Requirement Area | Brief Description |
|------------------|--|
| Performance | <ul style="list-style-type: none">• Big problems of performance with the IEBCopy coping from pdse to pds• Modify the way IEBCOPY uses PDSE directory when copying a member. Other utilities as linkedit(binder) do it better and then much faster.• Explicitly addresses PDSE to PDS performance and not PDS to PDSE performance. |
| Data Integrity | <ul style="list-style-type: none">• IEBCOPY needs to be enhanced to make additional data integrity checks to detect corrupted members. This could also be an option for IEBCOPY to set the importance on integrity. |
| IEBCOPY Replace | <ul style="list-style-type: none">• IEBCOPY needs to have a keyword to force an ALIAS to replace a primary member. Products like DB2 can change many modules and they are replacing primary members with aliases, IEBCOPY needs to have an option to the REPLACE keyword to force the member to be replaced by an alias.• IEBCOPY processing should allow this copy of a member of a partitioned dataset to itself.• IEBCOPY needs to have a keyword to force an ALIAS to replace a primary member.• IEBCOPY should show when a member is REPLACED during a copy operation. |
| Duplicate Names | <ul style="list-style-type: none">• Allow IEBCOPY to use duplicate member names; Copy the same member multiple times in one operation. |



IEBCOPY Outstanding Requirements

| Requirement Area | Brief Description |
|------------------|---|
| Messages | <ul style="list-style-type: none">•Amend IEBCOPY to give consistency in COND CODE settings when processing a copy that selects zero members. At present IEBCOPY returns inconsistent COND CODE values when performing a various copies resulting in zero members being selected.•When IEBCOPY is invoked to copy an unloaded PDS containing load modules to a PDSE RECFM=U, the COPY correctly ends in error. Need clearer error messages to document this condition.•IEBCOPY warning messages - Issue W and/or E suffix messages for severity 4 errors. Show return code for each COPY/COPYMOD.•IEBCOPY behavior should be coherent between PDS and PDSE usage for the same request. Specific to messages and return codes. |
| Space Mgmt | <ul style="list-style-type: none">•Enhance FAMS Storage Manager to more effectively manage FAMS storage to avoid ABEND878 abends during IEBCOPY of large PDSE data sets. For very large PDSE data sets like those containing 500K members, these control blocks could end up exhausting subpool 229, key 5 storage thus resulting in an ABEND878 RC10. The actual maximum number of members that can be unloaded successfully will vary depending on the amount of private area virtual storage that is available within the address space and this in turn is affected by the overall system configuration. Reference apar OA36575.•Have IEBCOPY copy what it can before quitting or, have a new parameter such as 'attempt partial copy' or, automatically perform what the user had to do manually; copy a small number of members at a time. |

Requirements Discussion....

| | <p>Session 12393: IBM Responses to Requirements submitted from SHARE Storage</p> |
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Making z/OS users more productive

ISPF Productivity Tool for z/OS, V7.1



Ann: July 17 2012 GA: July 20 2012

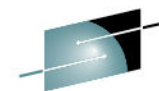


- **IPT V7.1** delivers new batch and online functions for performing critical operations on partitioned data set directories.
 - **New batch capability** with functions for manipulating partitioned and sequential data set directories:
 - Enhances IEBCOPY with additional user functionality.
 - Provides member name pattern matching capability for PDS and PDSE libraries when performing IEBCOPY-supported functions such as COPY, COPYGROUP, etc.
 - Gives improved performance for copy and compress operations for PDSs.
 - Includes functions for emptying, deleting, renaming, aliasing a partitioned library or sequential data set, expanding a PDS directory.
 - **New online functions** for manipulating partitioned data set directories, such as:
 - Cloning a partitioned library or sequential data set
 - Managing and displaying member titles

These new capabilities available now in IPT 7.1 running on z/OS V1R13!

<http://www.ibm.com/software/awdtools/ispfproductivitytool>

IPT contact: William Deason wwdeason@us.ibm.com



SHARE
Technology • Connections • Results

Thank You!!



philipmartin.com

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System z Social Media Channels

- Top Facebook pages related to System z:

- [IBM System z](#)
- [IBM Academic Initiative System z](#)
- [IBM Master the Mainframe Contest](#)
- [IBM Destination z](#)
- [Millennial Mainframer](#)
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- Top LinkedIn groups related to System z:

- [System z Advocates](#)
- [SAP on System z](#)
- [IBM Mainframe- Unofficial Group](#)
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- [Millennial Mainframer](#)
- [Destination z](#)
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- Top System z blogs to check out:

- [Mainframe Insights](#)
- [Smarter Computing](#)
- [Millennial Mainframer](#)
- [Mainframe & Hybrid Computing](#)
- [The Mainframe Blog](#)
- [Mainframe Watch Belgium](#)
- [Mainframe Update](#)
- [Enterprise Systems Media Blog](#)
- [Dancing Dinosaur](#)
- [DB2 for z/OS](#)
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- [DB2utor](#)



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IEBCOPY – Teaching an Old Dog Newer Tricks

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