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An Introduction to DFSORT: A Few Notes

- All of the DFSORT information contained within this presentation is derived from:
 - DFSORT: Getting Started (SC26-7527)
 - DFSORT Application Programming Guide (SC26-7523)
 - <u>http://www.ibm.com/servers/storage/support/software/sort/mvs/srtmpub.html</u>
 contains these book and may more DFSORT publications
- This focus of this session is that subset of DFSORT's functionality which is most used when doing basic analysis of RACF information. This is only a small subset of the many functions available with DFSORT and DFSORT's ICETOOL.
- These examples may or may not work if you are using a sort product other than DFSORT. Consult your OEM sort product vendor for questions on other sort products.

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An Introduction to DFSORT: The Big Picture

- IBM's DFSORT is a high-performance product that you can use to sort data, merge data, copy data, select data, reformat data, and create reports.
- DFSORT works on information that is contained within data sets.
- A <u>record</u> is a collection of related information that is managed as a unit, such as an employee record.
- A <u>field</u> is a specific portion of a record that defines a particular category of data, such as an employee's name.
 - In DFSORT, each field is identified by a starting position, a length, and a data type (format).
 - DFSORT supports a large number of data types, such as CH, ZD, PD, BI, FS, UFF, SFF, Y2K, etc.).
 - DFSORT can also parse delimited fields, such as CSV data, into fixed fields

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An Introduction to DFSORT: Sorting Data

- As its name implies, sorting is one of the main functions of DFSORT, and is invoked with the SORT statement:
 - SORT FIELDS=(startingPosition,length,dataType,sortOrder)
 - sortOrder: 'A' for ascending, 'D' for descending
 - dataType: 'CH' for character (EBCDIC) data
- For example, to sort the output of the RACF SMF Unload Utility by the type of record:
 - SORT FIELDS=(5,8,CH,A)

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An Introduction to DFSORT: Sorting Data...

- You can sort on multiple fields by specifying multiple sort fields.
- For example, to sort on the type of record, the date, and the time, code:

```
SORT FIELDS=(5,8,CH,A,32,10,CH,A,23,8,CH,A)
```

• Tip: If all of the fields have the same data type, you can code the FORMAT= keyword, which applies the specified data type to all of the fields in the statement:

SORT FORMAT=CH, FIELDS=(5,8,A,32,10,A,23,8,A)

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An Introduction to DFSORT: Selecting Records

- DFSORT can be used to select records using the INCLUDE and OMIT statements.
 - INCLUDE COND=(startingPosition,length,dataType,testType,value)
 - OMIT COND=(startingPosition,length,dataType,testType,value)
- You can specify either a constant value (C'YES ') or another field in the record (39,4,CH) for the value.
- You can code multiple selection criteria, joined together with the Boolean AND and OR operators
 - INCLUDE COND=(startingPosition,length,dataType,testType,value,AND|OR, startingPosition,length,dataType,testType...)
 - OMIT COND=(startingPosition,length,dataType,testType,value,AND|OR, startingPosition,length,dataType,testType...)
- You can code only one INCLUDE or OMIT statement per sort operation

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An Introduction to DFSORT: Selecting Records...

- You must code a SORT, MERGE, or COPY statement with your INCLUDE or OMIT statement
 - SORT FIELD=COPY or OPTION COPY can be used instead of SORT FIELDS=(....) if you
 don't want to or need to sort the input data
- Example: Select all of the RACF Database Unload records ('0200' in columns 5-8) which define users who have the SPECIAL, OPERATIONS, or AUDITOR attribute ('YES ' in columns 44-46, 49-51, or 390-392)

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An Introduction to DFSORT: The Substring Operator You can use the DFSORT substring ("SS") comparison test to find a specified character string anywhere in a field INCLUDE COND=(10,44,CH,SS,C'*') selects any record in which the character '*' appears within columns 10 to 53 Consider this example: INCLUDE COND=(5,4,CH,EQ,C'0500',AND, 266,4,CH,EQ,C'NO',AND,

 Which finds all general resource profiles (record type '0500') which are not generic (record offset 266 contains 'NO') but have a generic character in the name (the "SS" operands)

(10,249,SS,EQ,C'*',OR, 10,249,SS,EQ,C'%',OR, 10,249,SS,EQ,C'&'))

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IBM Systems and Technology Group An Introduction to DFSORT: Reformatting Records DFSORT allows extensive reformatting of records using the OUTREC statement and/or the INREC statement The OUTREC statement defines the format of the output record The OUTREC statement indicates: What columns are to be copied to the output data set (startingPosition,length) What other data is to be inserted into the record Constant values System generated data Edited or converted numeric values Justified or squeezed data Sequence numbers Results of arithmetic expressions Example: To copy the user ID, programmer name, and owner of the IRRDBU00 User Basic Data record, with a blank between each field, code: SORT FIELDS=COPY INCLUDE COND=(5,4,CH,EQ,C'0200') OUTREC FIELDS=(1,4,10,8,X,78,20,X,30,8) OPTION VLSHRT We'll talk about what "1,4" means in a moment

An Introduction to DFSORT: Reformatting Records...

- One very powerful feature of OUTREC is the ability to insert text into a record during the reformatting processing
 - Can be very useful in transforming data into more usable forms

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Example: To copy the user ID, programmer name, and owner of the IRRDBU00 User Basic Data record, with a blank between each field, you would code:

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An Introduction to DFSORT: Reformatting Records... The owner of ID AUDTR01 is MARKN and is assigned to EXTERNAL AUDITOR 01 The owner of ID AUDTR02 is MARKN and is assigned to EXTERNAL AUDITOR 02

- Some other powerful features of OUTREC are the ability to:
 - Reformat different records in different ways using IFTHEN clauses
 - Overlay selected bytes of a record using OVERLAY fields
 - > Extract delimited fields (such as CSV) into fixed fields
 - Justify and sqeeze data





An Introduction to DFSORT: OUTFIL

- The OUTFIL statement allows you to create one or more output data sets from a single pass of your input data
 - The output data sets can be complete copies of the input data set or may contain only selected records
 - You can select the records go into each output data set
 - · Based on values within the record
 - · Based on relative record number
 - "Round robin" or "one rotation" assignment
 - · Every "nth" record
 - You can reformat the selected records in various ways
 - Very useful if you want to partition your RACF data base information or SMF
 - OUTFIL can also be used to create reports.

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An Introduction to DFSORT: OUTFIL...

To put all of the IRRADU00 ACCESS records in one data set, all of the JOBINIT records into a second data set, and the remaining records into a third data set, you could code:

```
//SELECT
           EXEC PGM=SORT
//SYSOUT
           DD SYSOUT=*
          DD DISP=SHR,DSN=MARKN.TEST.IRRADU00
//SORTIN
//ACCESS
          DD DISP=SHR,DSN=MARKN.ACCESS.IRRADU00
//JOBINIT DD DISP=SHR,DSN=MARKN.JOBINIT.IRRADU00
          DD DISP=SHR,DSN=MARKN.OTHERS.IRRADU00
//OTHERS
//SYSIN DD *
SORT
        FIELDS=COPY
OUTFIL FNAMES=ACCESS, INCLUDE=(5,4,CH,EQ,C'ACCESS')
 OUTFIL FNAMES=JOBINIT, INCLUDE=(5,4,CH,EQ,C'JOBINIT')
OUTFIL FNAMES=OTHERS, SAVE
```

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An Introduction to DFSORT: Symbols

- DFSORT allows you to define symbols that can be used to replace fields, constants, and output columns in DFSORT and ICETOOL statements with easy-to-read labels
 - USBD_OPER could be used as a symbol for 44,1,CH
- The RACFICE package on the "Downloads" section of the RACF web site (http://www.ibm.com/servers/eserver/zseries/zos/racf/) contains DFSORT symbols for all of the IRRADU00 and IRRDBU00 fields. Using these symbols you can specify:

```
SORT FIELDS=(USBD_NAME,A)

INCLUDE COND=(GRBD_RECORD_TYPE,EQ,C'0500',AND,

GRBD_GENERIC,EQ,C'NO ',AND,

(GRBD_NAME,SS,EQ,C'*',OR,

GRBD_NAME,SS,EQ,C'*',OR,

GRBD_NAME,SS,EQ,C'&'))
```

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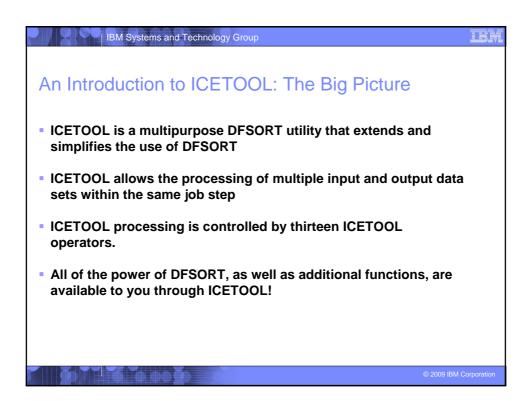
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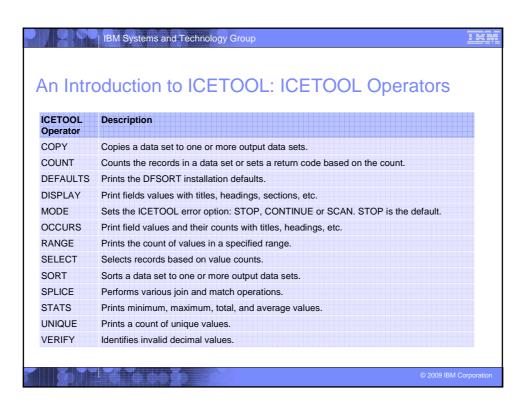


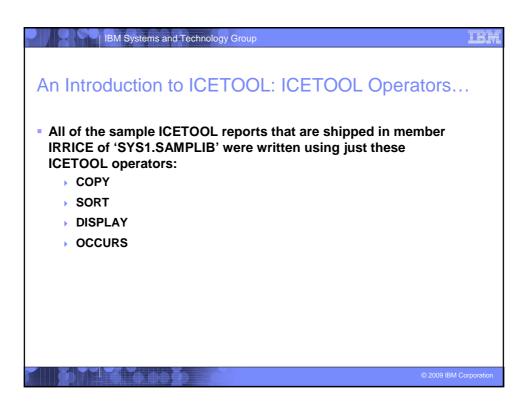
An Introduction to DFSORT: Variable Length Records

- In z/OS, there are two data set structures:
 - Fixed-length records, in which all records in the data set have the same length (RECFM=F, or FB) and
 - Variable-length records, in which the records in the data seta do not have to have the same size records (RECFM=V,VB, VS, or VBS). Each record must have a length with is less than the maximum record length specified for the data set.
 - Each variable length record is prefixed with a four-byte record descriptor word (RDW) that contains the length of the record in the first two bytes.
- When specifying the starting position, the RDW must by included.
 - ... which means that you must add 4 to all of the starting positions documented for the IRRADU00 and IRRDBU00 output in RACF Macros and Interfaces. The DFSORT Symbols mentioned previously already have the RDW built into their starting positions.









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An Introduction to ICETOOL: SORT

- The SORT operator allows you to sort data, select the records which are of interest, reformat the records, etc.
- The syntax is:

```
SORT FROM(indd) USING(cntl) TO(outdd)
```

- ...where
 - indd is the input data set DD name
 - outdd is the output data set DD name
 - cntl is the one to four character prefix for the DD name that contains the DFSORT control statements
 - The DD name is formed by appending "CNTL" to the USING value

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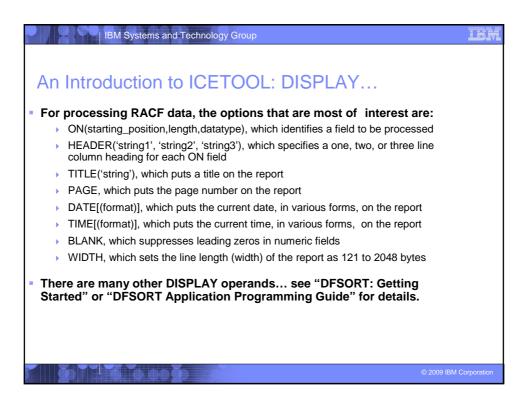


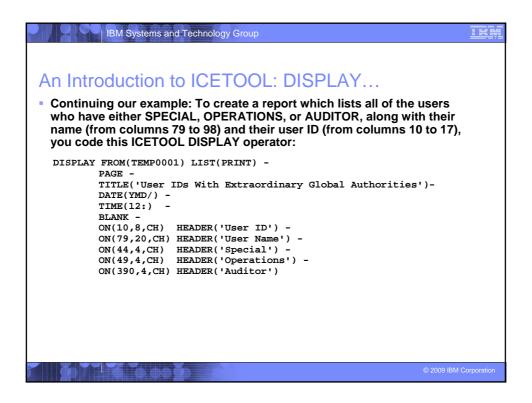
An Introduction to ICETOOL: SORT...

- Let's create a realistic example. To create a report that lists all of the users who have either SPECIAL, OPERATIONS, or AUDITOR, we have to find all of the user basic data records (which have '0200' in columns 5 to 9) and which have a 'Y' in column 44, column 49, or column 390.
- The DFSORT INCLUDE statement which does this is:

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An Introduction to ICETOOL: DISPLAY The DISPLAY operator allows you to: Select the information that is going to be in your report Specify single line or multi-line column headings Specify the title elements The syntax is: DISPLAY FROM(indd) ON(field,<parms>) LIST(listdd) options ...where indd is the DD name of the input data set ifield is the starting position, length and data type of the field that is to be in displayed the report Iistdd is the DD name of the report data set ON(field) can be (and usually is) repeated, once for each field in the report, up to 20 times

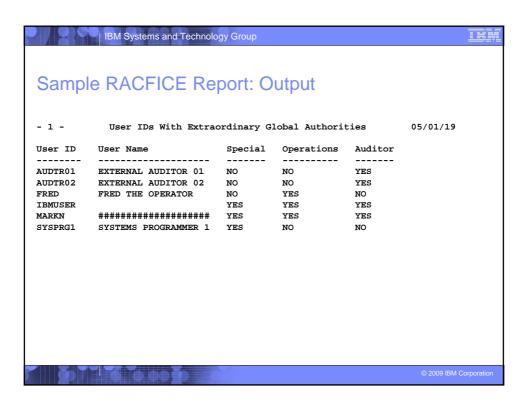


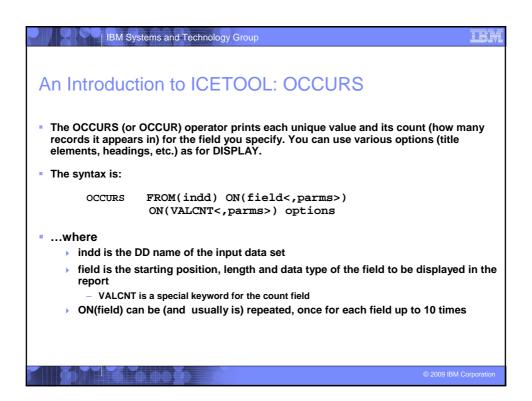


```
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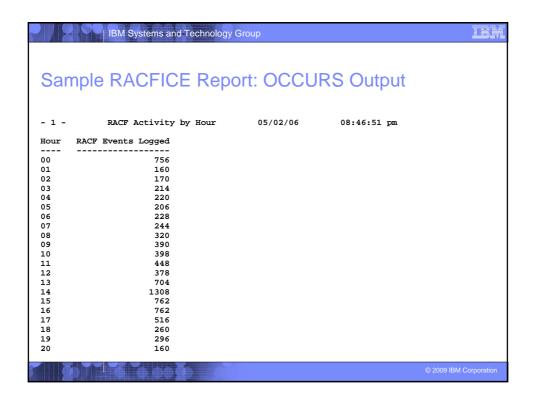
An Introduction to ICETOOL: JCL

//REPORT EXEC POM=ICETOOL
//TOOLMSG DD SYSOUT=*
//DEMSG DD SYSOUT=*
//DEMSG DD SYSOUT=*
//REMPOOL DD DISP=SHR,DSN=USER01.IRRDBU00
//EMPOOL DD DISP=SHR,DSN=USER01.IRRDBU00
//RINT DD SYSOUT=*
//TOOLIN DD SYSOUT=*
//TOOLIN DD *
SORT FROM(TEMPOOL) USING(RACF)
DISPLAY FROM(TEMPOOL) LIST(PRINT) -
PAGE -
TITLE('User IDs With Extraordinary Global Authorities') -
DATE(WIM) -
TIME(12:) -
TIME(12:) -
BLANK -
ON(10,8,CH) HEADER('User ID') -
ON(19,2,0,CH) HEADER('User ID') -
ON(19,4,4,CH) HEADER('Special') -
ON(44,4,CH) HEADER('Special') -
ON(44,4,CH) HEADER('Special') -
ON(390,4,CH) HEADER('Special') -
ON(390,4,CH) HEADER('Special') -
ON(390,4,CH) HEADER('Special') -
SORT FIELDS=(5,8,CH,A)
INCLUDE COND=((44,1,CR,RD,C'Y',OR,
49,1,CH,RD,C'Y',OR,
390,1,CH,EQ,C'Y'),AND,
5,4,CH,EQ,C'Y'),AND,
5,4,CH,EQ,C'YOON)
/*
```

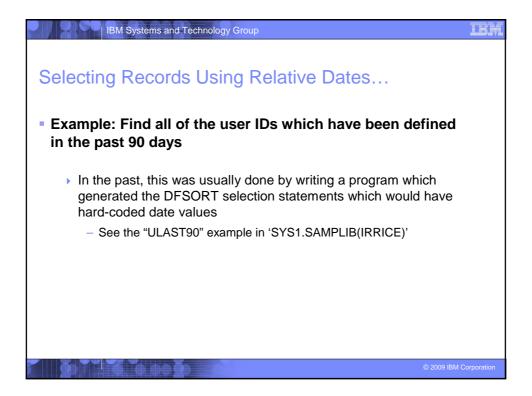


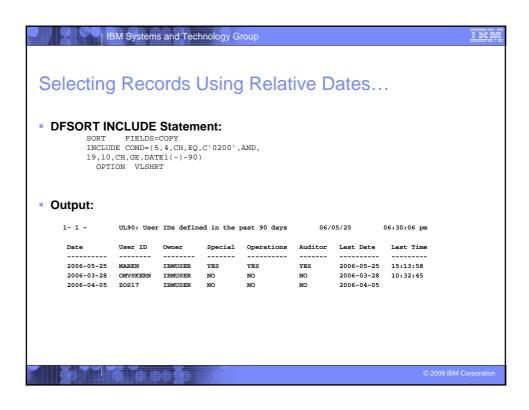


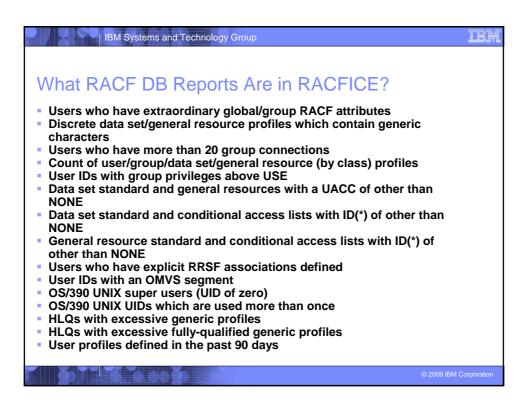
```
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An Introduction to ICETOOL: OCCURS...
Example: Create a report which counts all of the RACF events by
    The time is in hh:mm:ss format starting in column
     23
The ICETOOL OCCURS statement for this is:
    OCCURS FROM(IRRADU00) LIST(PRINT) -
        PAGE ·
        TITLE('RACF Activity by Hour') -
        DATE(YMD/) -
        TIME(12:)
        BLANK -
        ON(23,2,CH)
                                   HEADER('Hour') -
        ON(VALCNT)
                                   HEADER('RACF Events Logged')
```



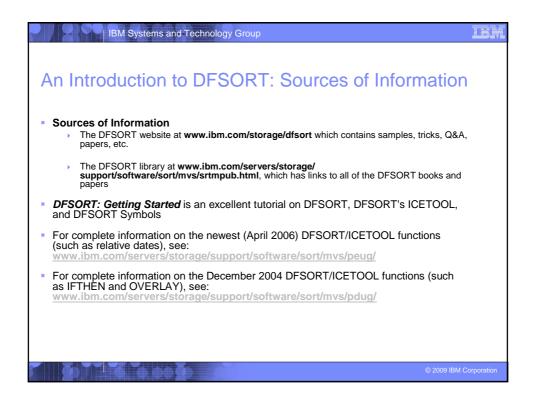
Selecting Records Using Relative Dates DFSORT allows you to select records based on a relative date, such as: 30 days ago 60 days from now For IRRDBU00 and IRRADU00 output, the format of a DFSORT relative date is: DATE1(-)-d for past dates or DATE1(-)+d for future dates DATE1 is the DFSORT date format for YYYYXMMxDD dates () is the separator IRRDBU00 and IRRADU00 dates are in the format yyy-mm-dd "-d" is the number of days prior to the current date; "+d" is the number of dates after the current date (not particularly useful for IRRADU00 and IRRDBU00 output)

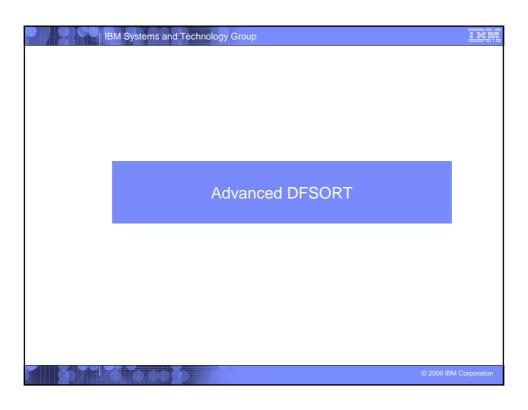






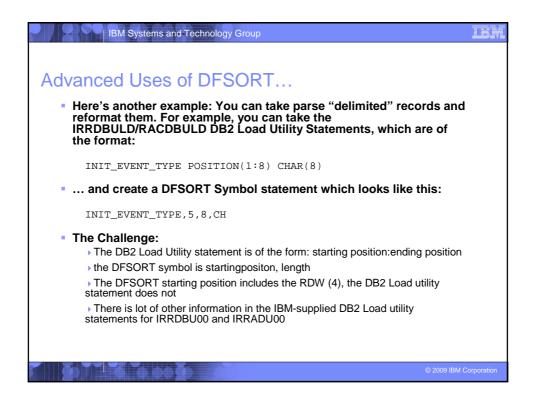
What SMF RACFICE Reports are in RACFICE? Events associated with a specific user User IDs with excessive incorrect passwords Terminals with excessive incorrect passwords Accesses allowed due to WARNING mode profiles Accesses allowed because the user has OPERATIONS Users who are using Automatic Command Direction Users who are directing command explicitly User who log on with LOGON BY RACLINK audit records Users who are using password synchronization Access violations

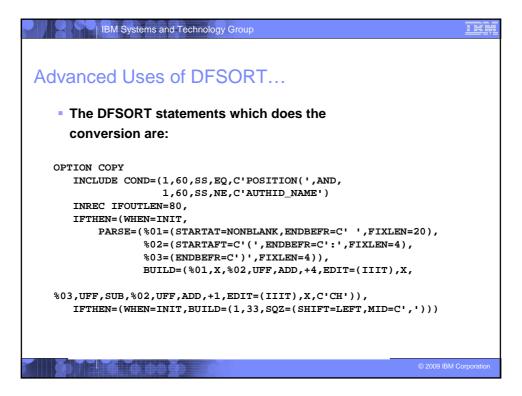
















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