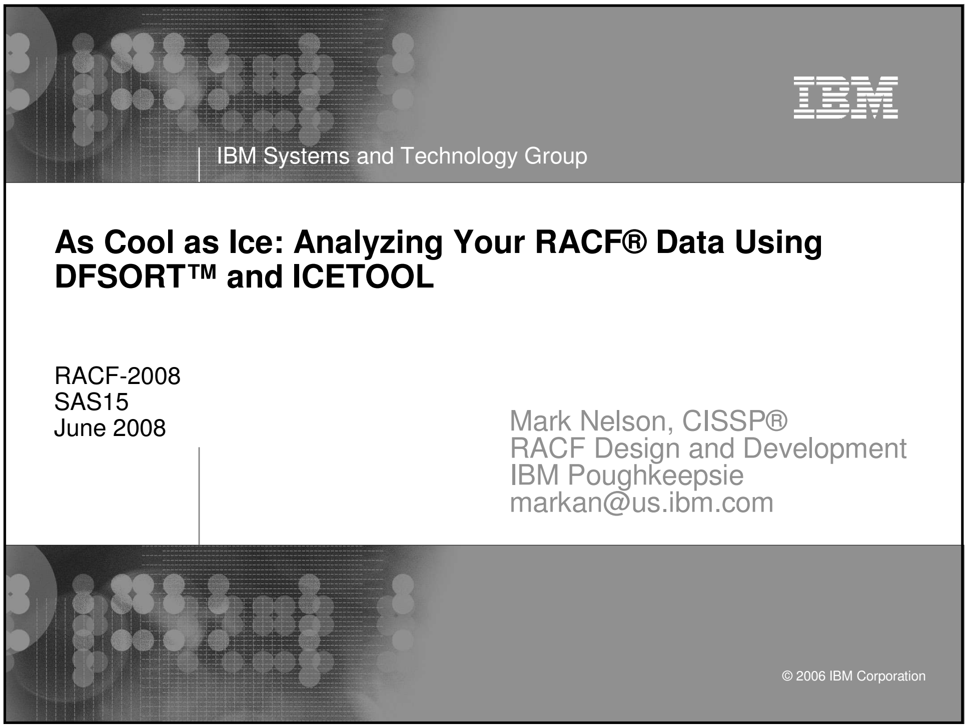

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As Cool as Ice: Analyzing Your RACF® Data Using DFSORT™ and ICETOOL

RACF-2008
SAS15
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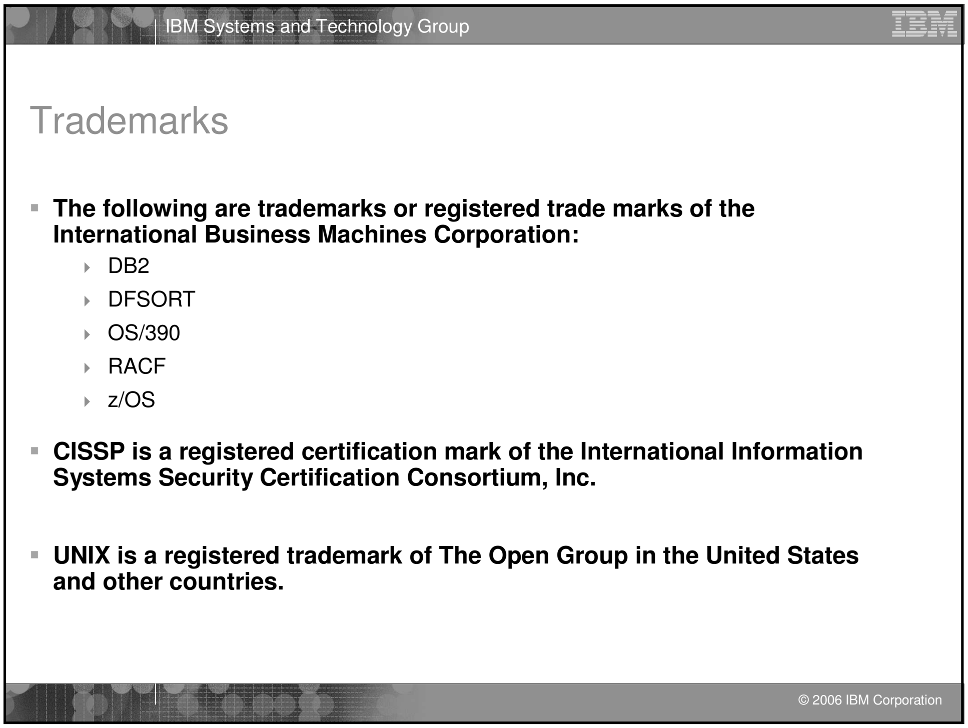

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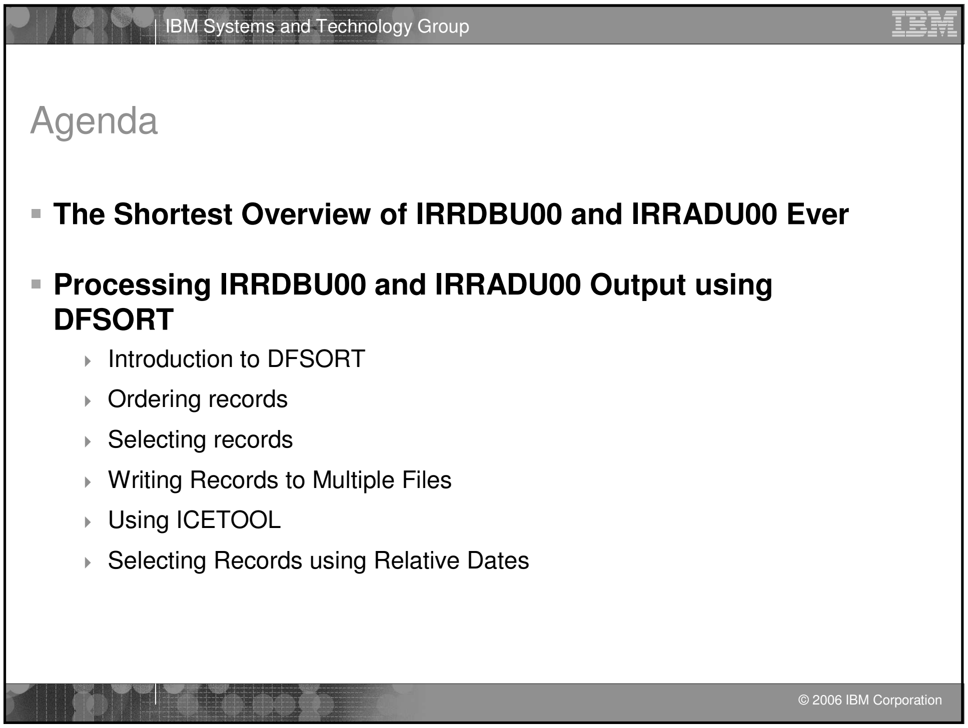
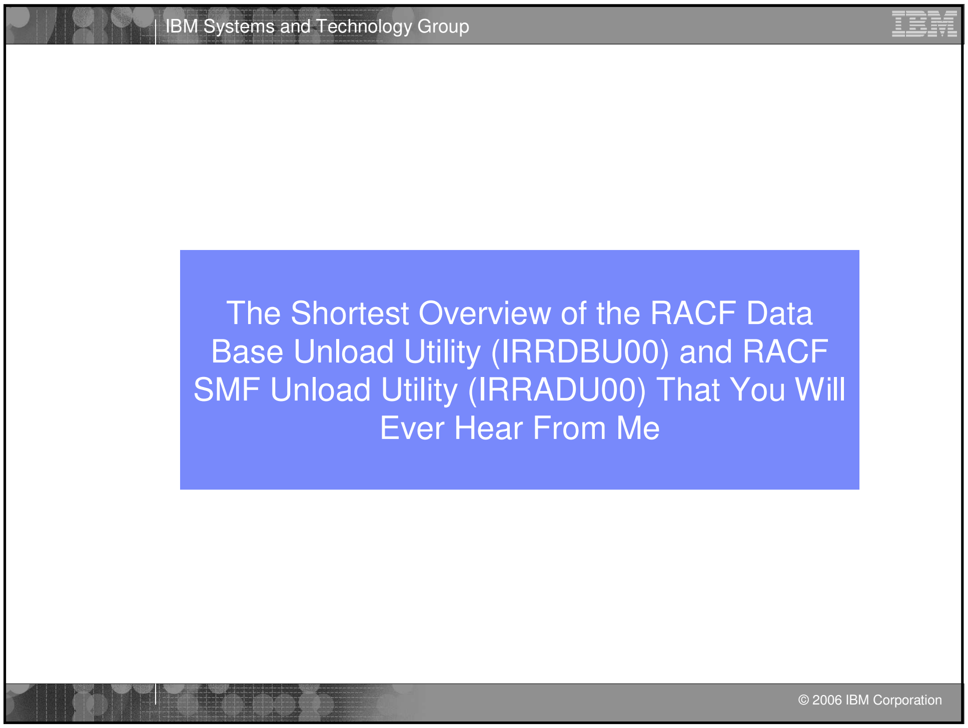
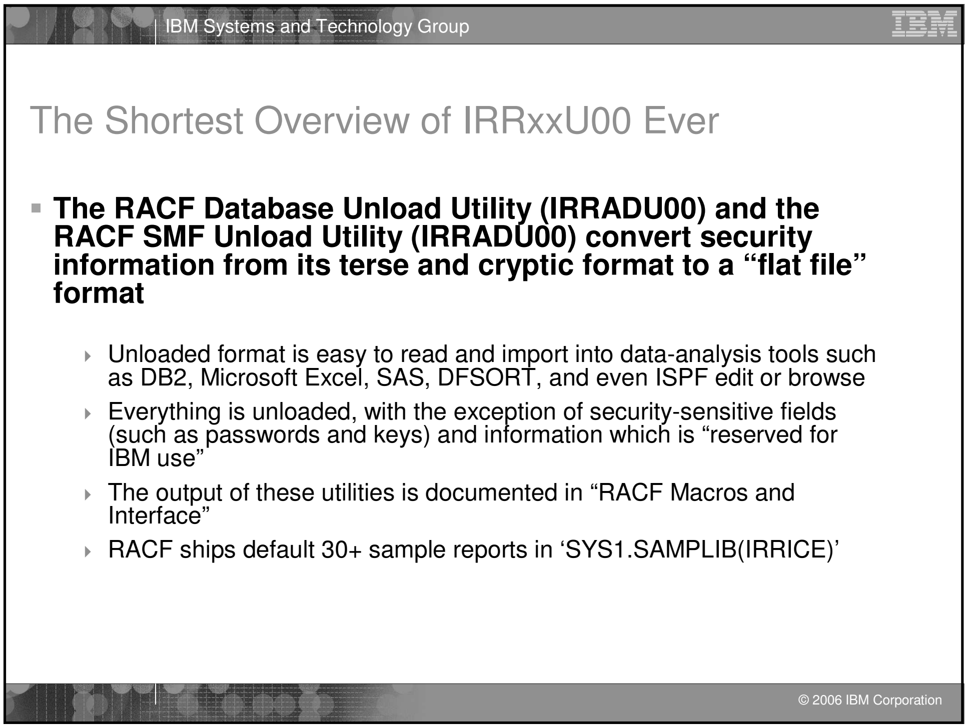


Agenda

- **The Shortest Overview of IRRDBU00 and IRRADU00 Ever**
- **Processing IRRDBU00 and IRRADU00 Output using DFSORT**
  - Introduction to DFSORT
  - Ordering records
  - Selecting records
  - Writing Records to Multiple Files
  - Using ICETOOL
  - Selecting Records using Relative Dates

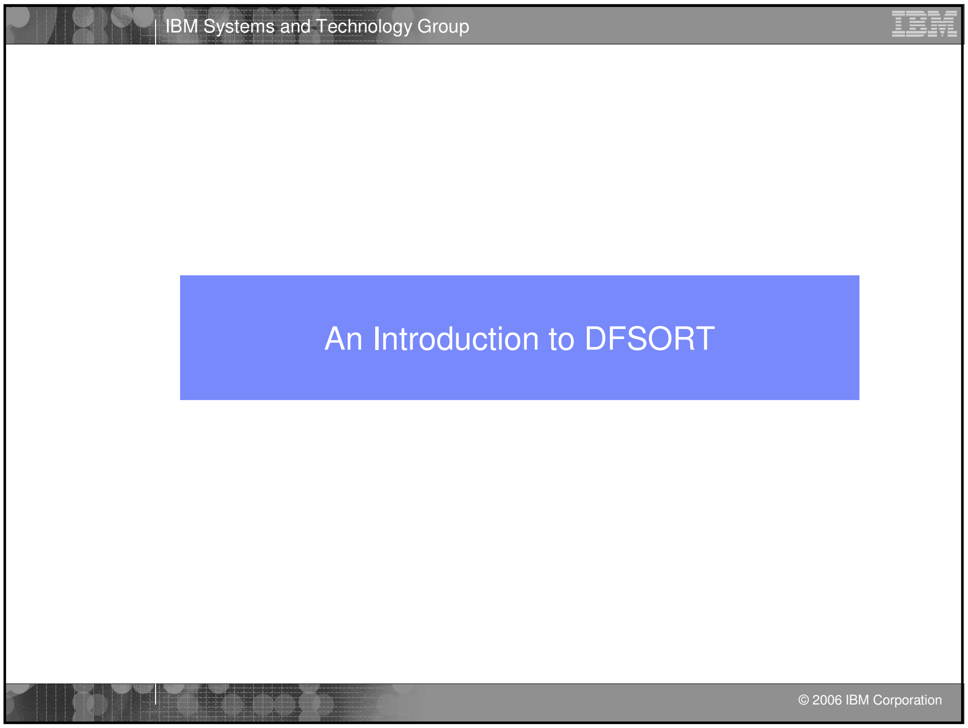


The Shortest Overview of the RACF Data Base Unload Utility (IRRDBU00) and RACF SMF Unload Utility (IRRADU00) That You Will Ever Hear From Me

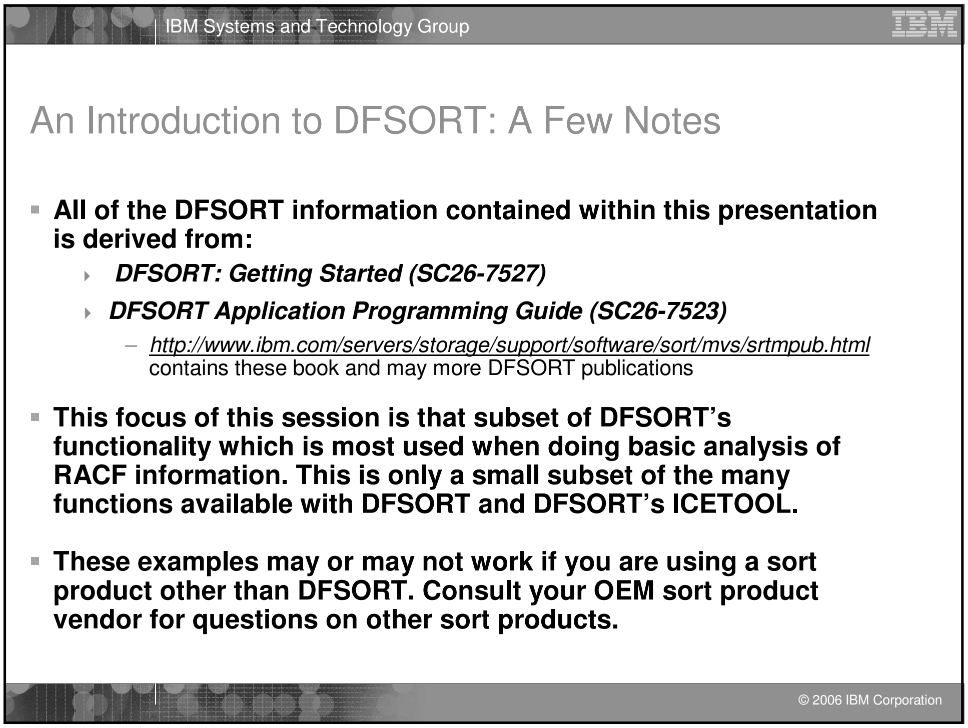


The Shortest Overview of IRRxxU00 Ever

- **The RACF Database Unload Utility (IRRADU00) and the RACF SMF Unload Utility (IRRADU00) convert security information from its terse and cryptic format to a “flat file” format**
  - Unloaded format is easy to read and import into data-analysis tools such as DB2, Microsoft Excel, SAS, DFSORT, and even ISPF edit or browse
  - Everything is unloaded, with the exception of security-sensitive fields (such as passwords and keys) and information which is “reserved for IBM use”
  - The output of these utilities is documented in “RACF Macros and Interface”
  - RACF ships default 30+ sample reports in ‘SYS1.SAMPLIB(IRRICE)’



An Introduction to DFSORT



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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)***
    - *http://www.ibm.com/servers/storage/support/software/sort/mvs/srtmpub.html* 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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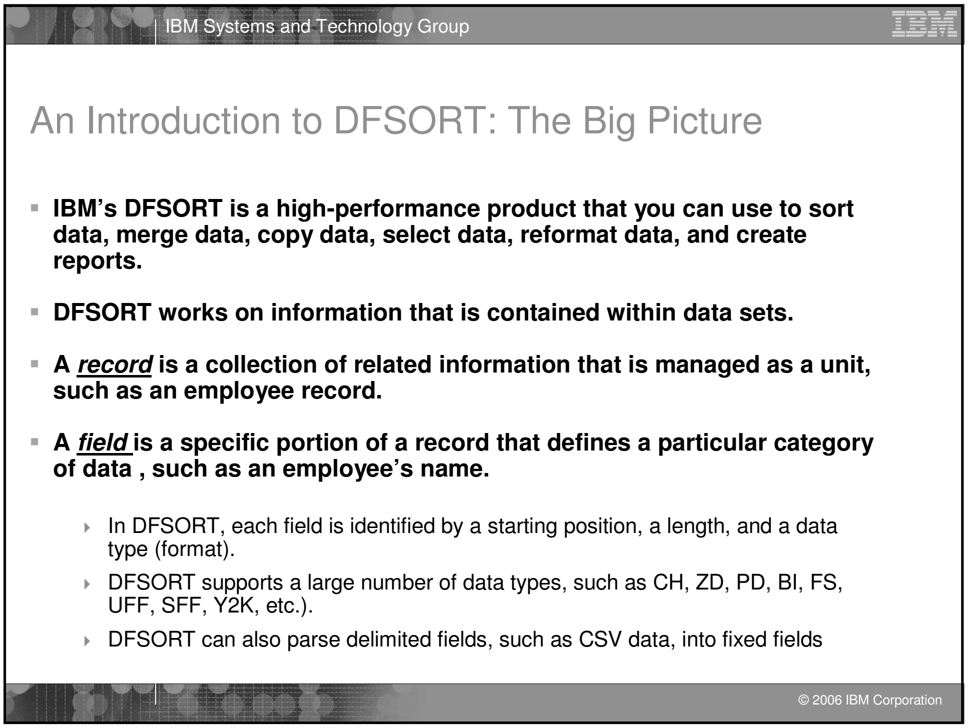

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An Introduction to DFSORT: The Big Picture

- **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 *record* is a collection of related information that is managed as a unit, such as an employee record.**
- **A *field* 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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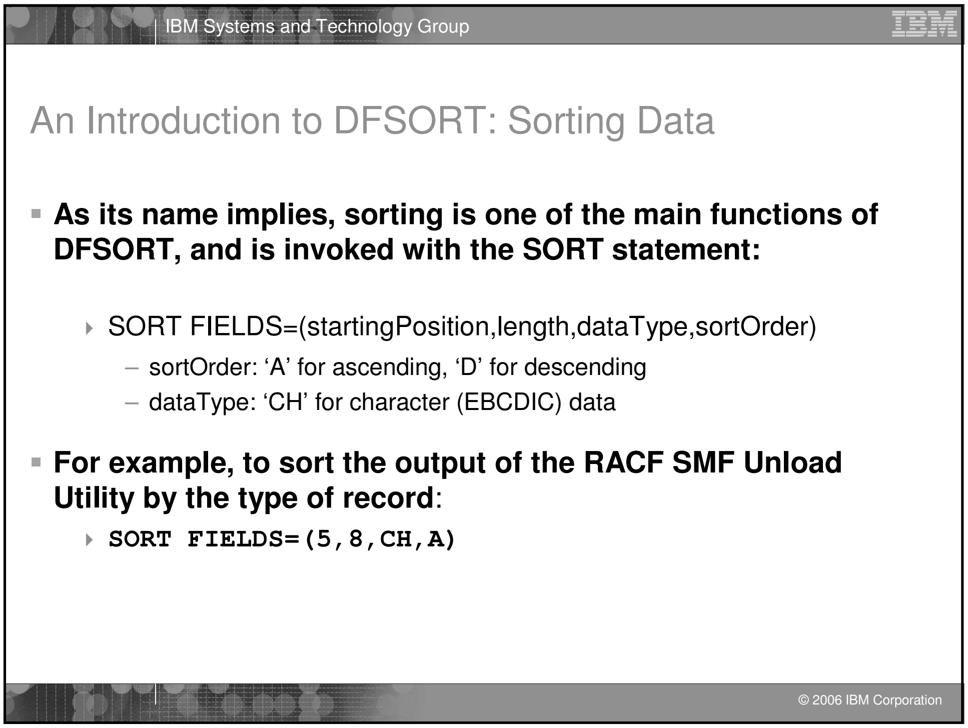
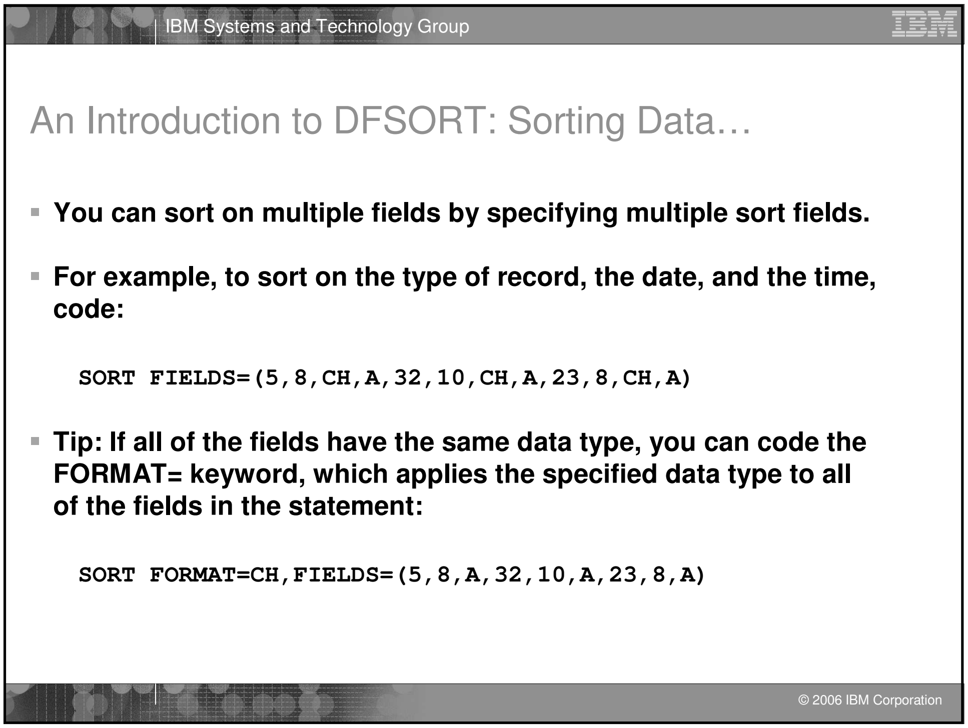


An Introduction to DFSORT: Sorting Data

- **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)`**



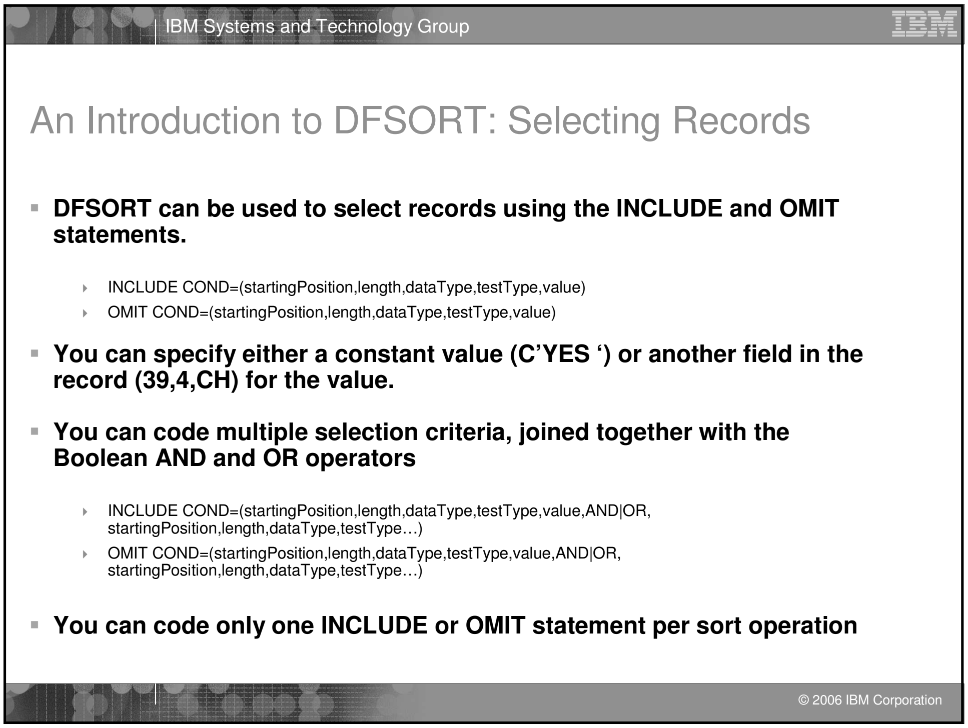
An Introduction to DFSORT: Sorting Data…

- **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)
```

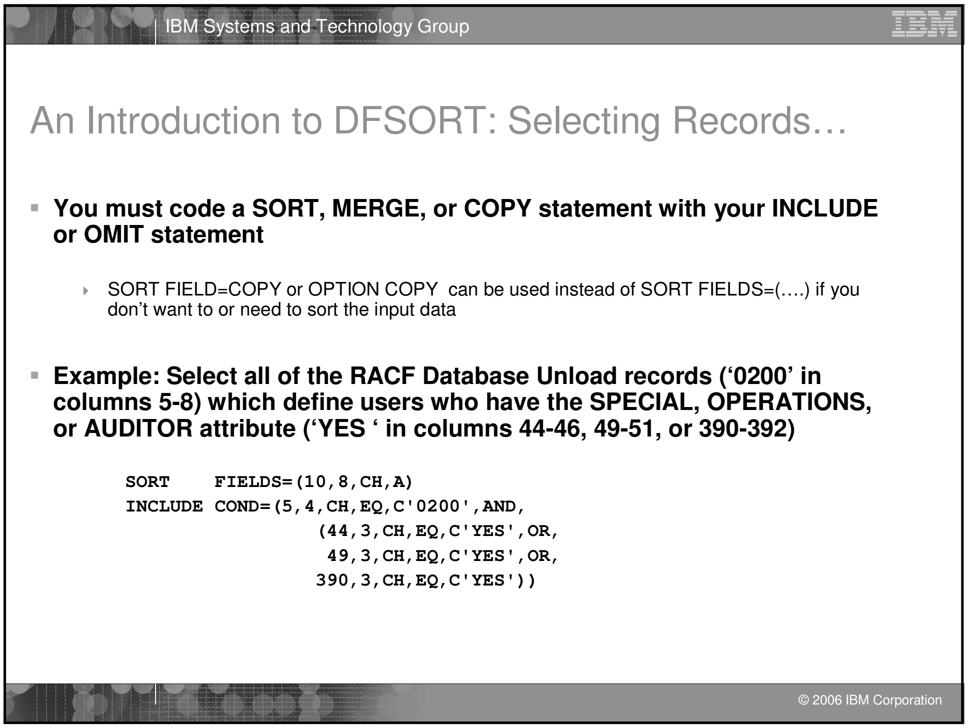
- **Tip: If all of the fields have the same data type, you can code the FORMAT= keyword, which applies the specified data type to all of the fields in the statement:**

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



An Introduction to DFSORT: Selecting Records

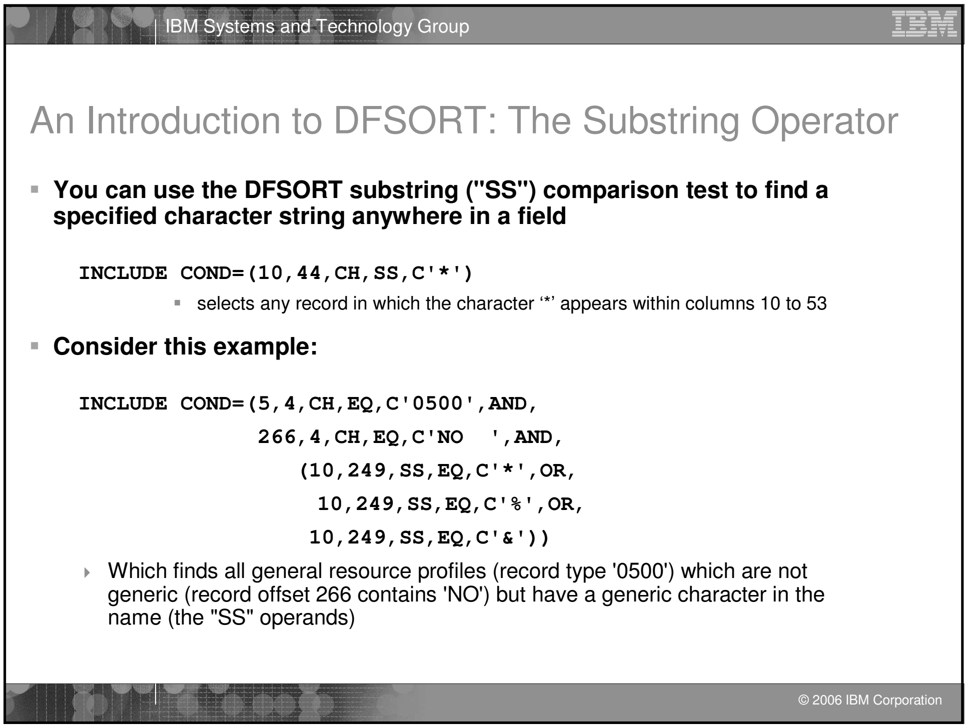
- **DFSORT can be used to select records using the INCLUDE and OMIT statements.**
  - INCLUDE COND=(startingPosition,length,dataType,testType,value)
  - OMIT COND=(startingPosition,length,dataType,testType,value)
- **You can specify either a constant value (C'YES ') or another field in the record (39,4,CH) 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**



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)**

```
SORT    FIELDS=(10,8,CH,A)
INCLUDE COND=(5,4,CH,EQ,C'0200',AND,
              (44,3,CH,EQ,C'YES',OR,
               49,3,CH,EQ,C'YES',OR,
              390,3,CH,EQ,C'YES'))
```



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**

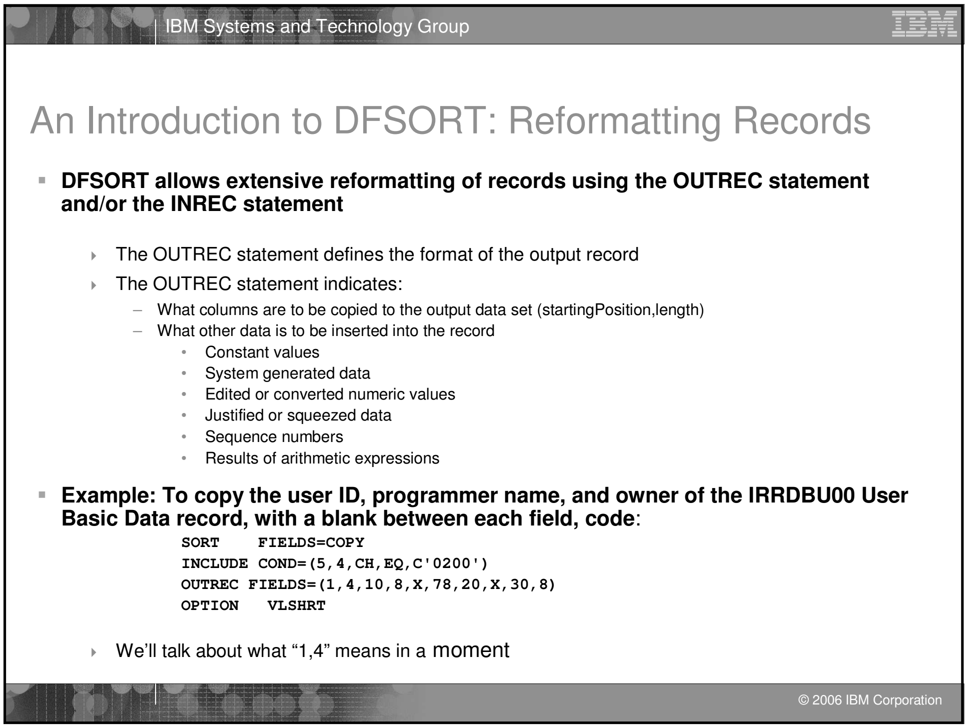
```
INCLUDE COND=(10,44,CH,SS,C'*')
```

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

  - 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)

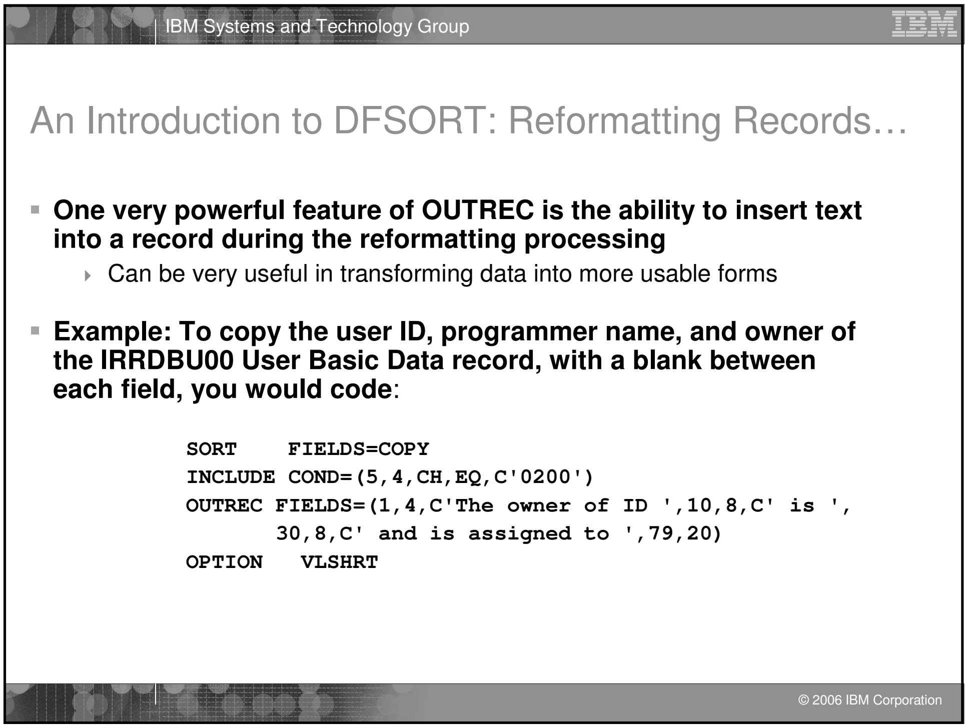


An Introduction to DFSORT: Reformatting Records

- **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
```

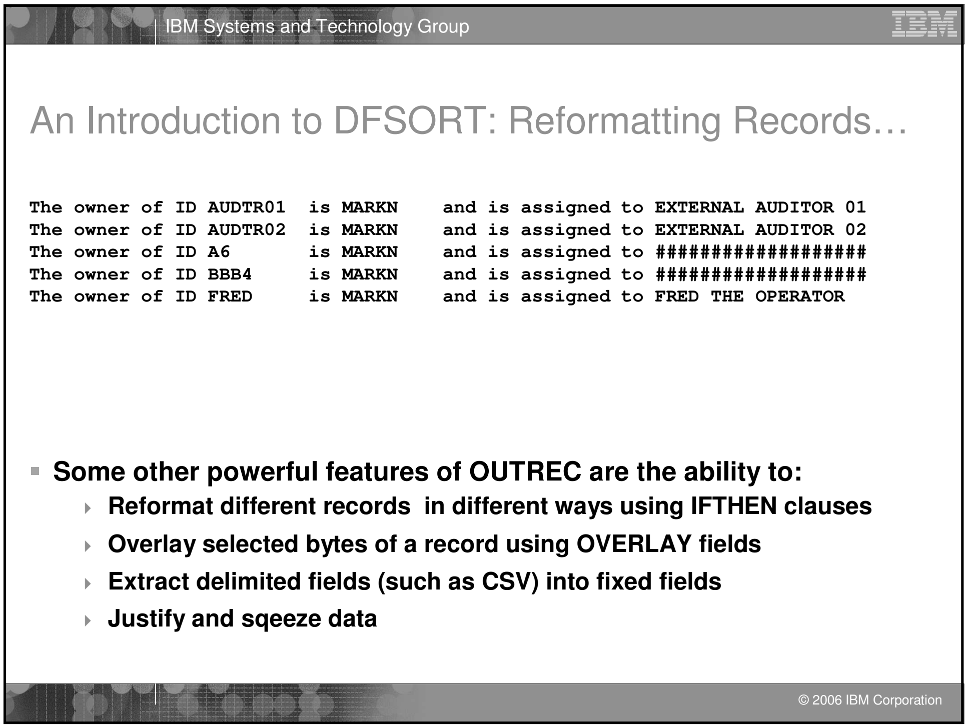
  - We'll talk about what "1,4" means in a moment



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
- **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**:

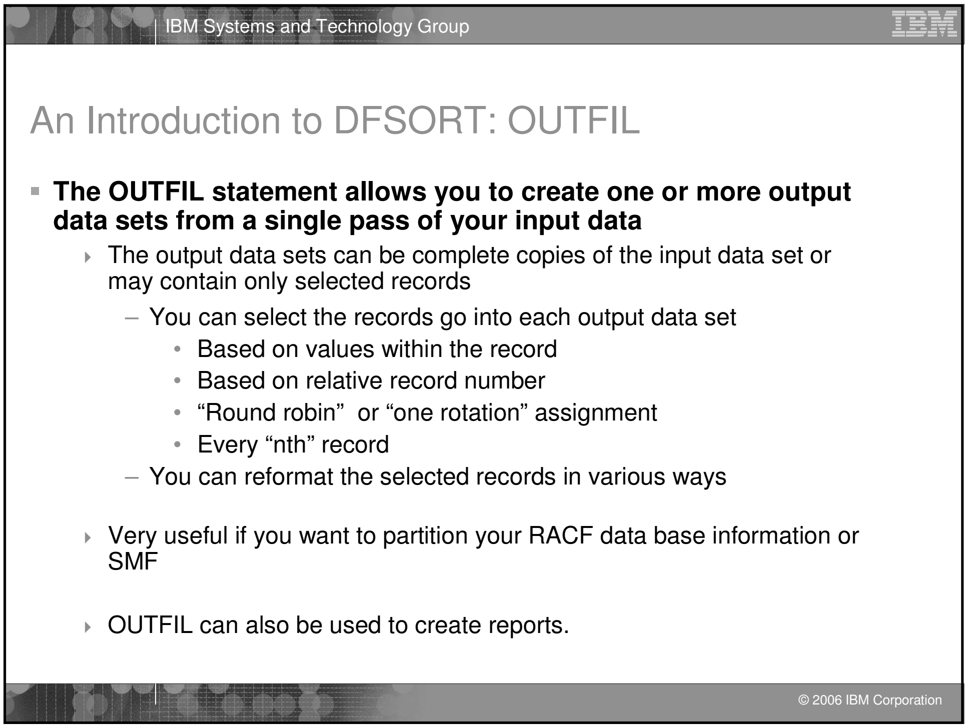
```
SORT    FIELDS=COPY
INCLUDE COND=(5,4,CH,EQ,C'0200')
OUTREC FIELDS=(1,4,C'The owner of ID ',10,8,C' is ',
       30,8,C' and is assigned to ',79,20)
OPTION   VLSHRT
```



An Introduction to DFSORT: Reformatting Records…

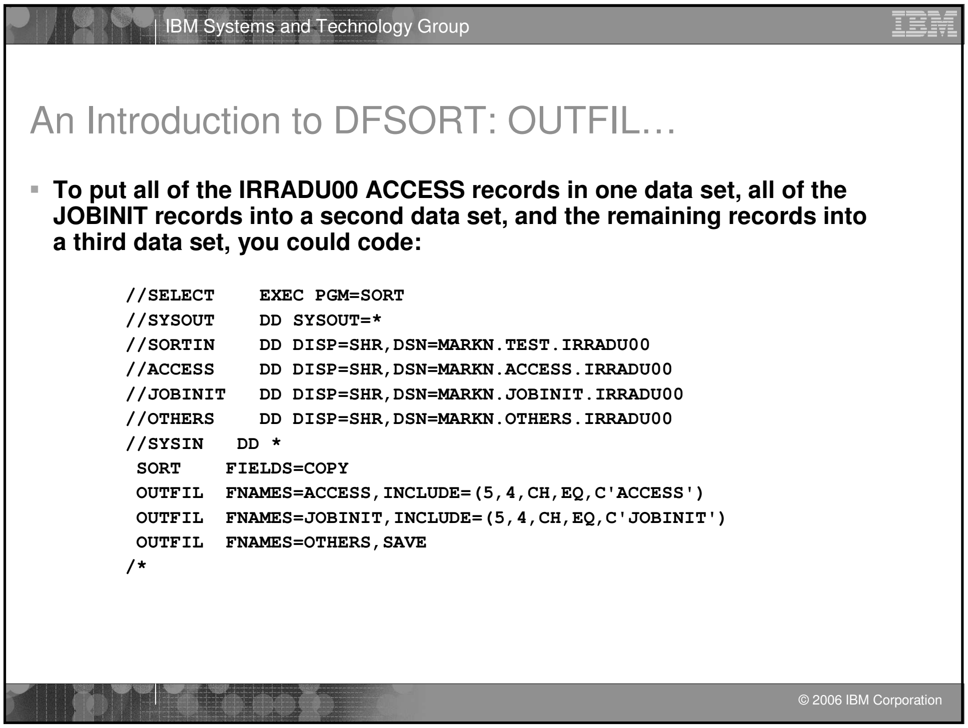
```
The owner of ID AUDTR01  is MARKN    and is assigned to EXTERNAL AUDITOR 01
The owner of ID AUDTR02  is MARKN    and is assigned to EXTERNAL AUDITOR 02
The owner of ID A6       is MARKN    and is assigned to ####################
The owner of ID BBB4     is MARKN    and is assigned to ####################
The owner of ID FRED     is MARKN    and is assigned to FRED THE OPERATOR
```

- **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

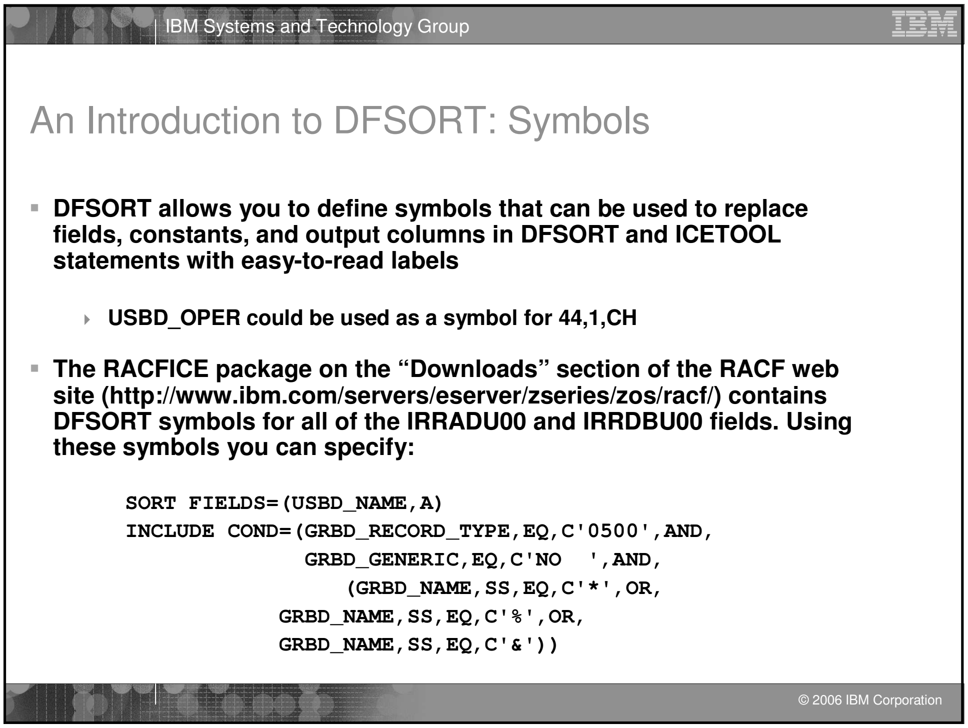
- **The OUTFIL statement allows you to create one or more output data sets from a single pass of your input data**
  - The output data sets can be complete copies of the input data set or may contain only selected records
    - You can select the records go into each output data set
      - Based on 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.



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:**

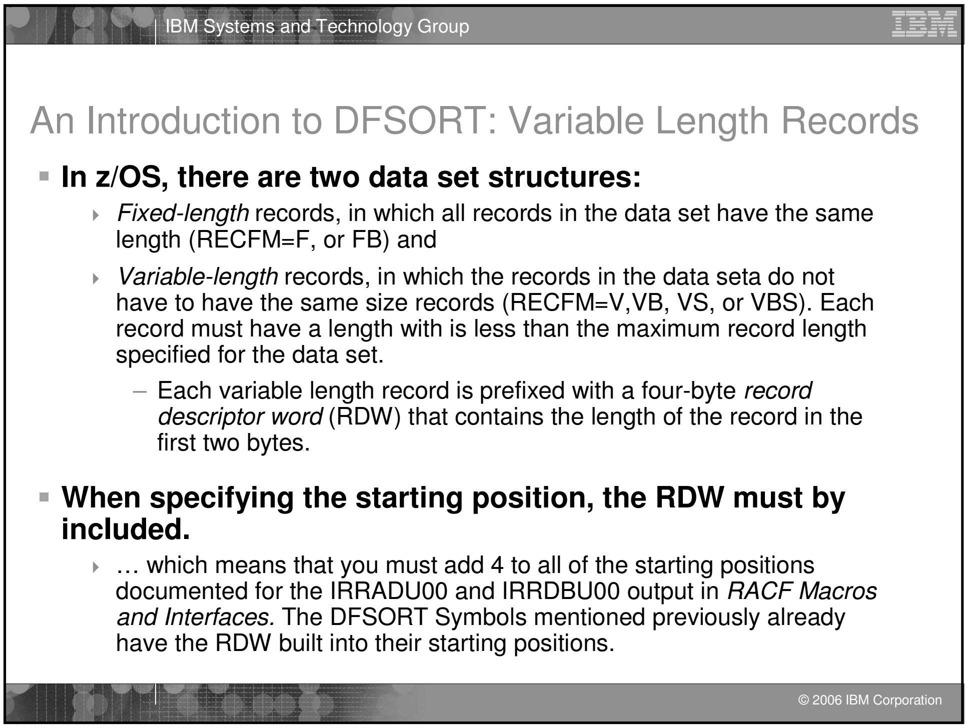
```
//SELECT    EXEC PGM=SORT
//SYSOUT    DD SYSOUT=*
//SORTIN    DD DISP=SHR,DSN=MARKN.TEST.IRRADU00
//ACCESS    DD DISP=SHR,DSN=MARKN.ACCESS.IRRADU00
//JOBINIT   DD DISP=SHR,DSN=MARKN.JOBINIT.IRRADU00
//OTHERS    DD DISP=SHR,DSN=MARKN.OTHERS.IRRADU00
//SYSIN   DD *
 SORT    FIELDS=COPY
 OUTFIL  FNAMES=ACCESS,INCLUDE=(5,4,CH,EQ,C'ACCESS')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



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:**

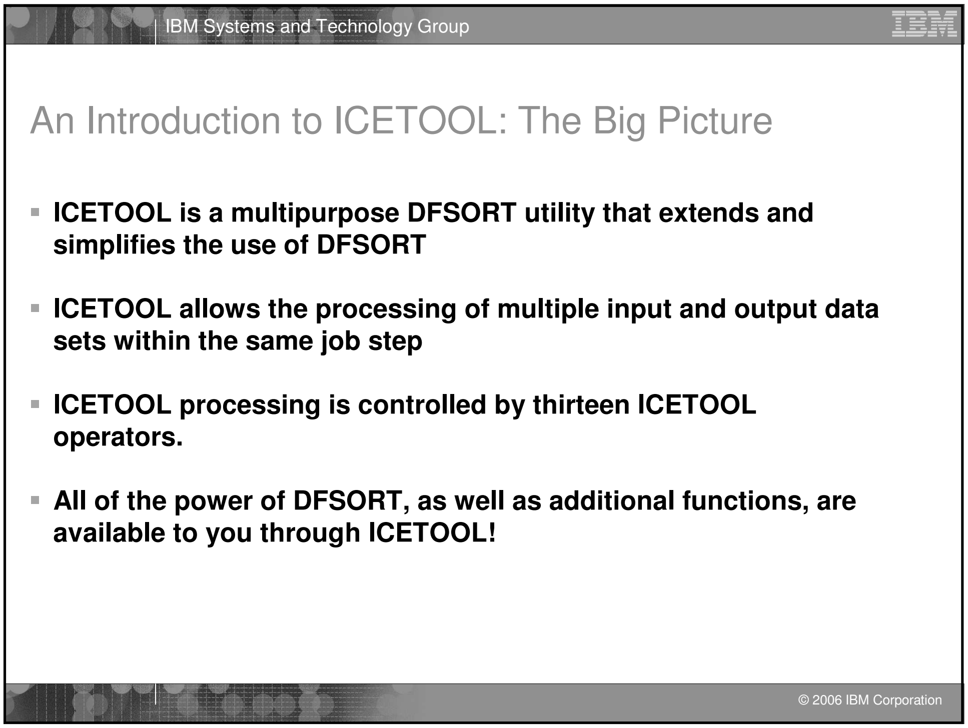
```
SORT FIELDS=(USBD_NAME,A)
INCLUDE COND=(GRBD_RECORD_TYPE,EQ,C'0500',AND,
              GRBD_GENERIC,EQ,C'NO  ',AND,
                 (GRBD_NAME,SS,EQ,C'*',OR,
            GRBD_NAME,SS,EQ,C'%',OR,
            GRBD_NAME,SS,EQ,C'&'))
```



An Introduction to DFSORT: Variable Length Records

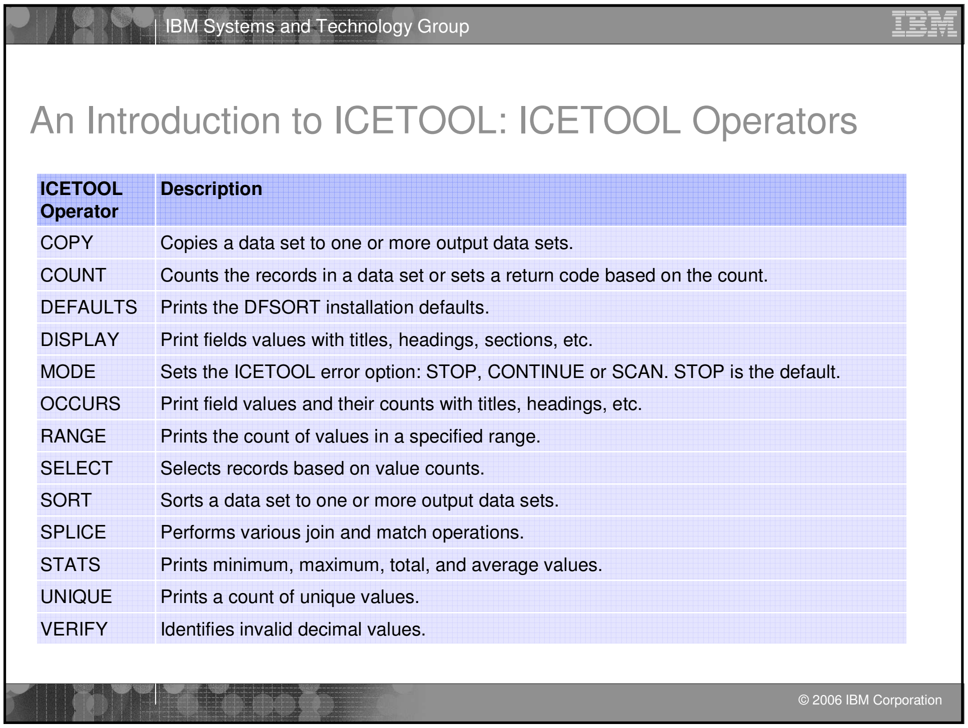
- **In z/OS, there are two data set structures:**
  - *Fixed-length* records, in which all records in the data set have the same length (RECFM=F, or FB) and
  - *Variable-length* records, in which the records in the data seta do not have to have the same size records (RECFM=V,VB, VS, or VBS). Each record 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.

DFSORT’s ICETOOL Utility



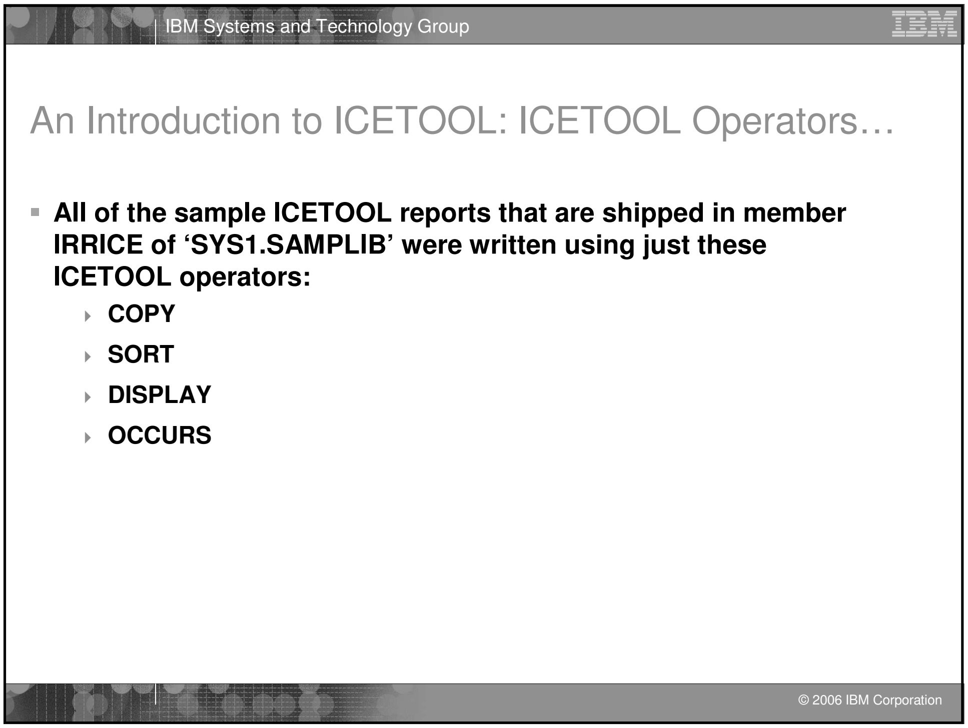
An Introduction to ICETOOL: The Big Picture

- **ICETOOL is a multipurpose DFSORT utility that extends and simplifies the use of DFSORT**
- **ICETOOL allows the processing of multiple input and output data sets within the same job step**
- **ICETOOL processing is controlled by thirteen ICETOOL operators.**
- **All of the power of DFSORT, as well as additional functions, are available to you through ICETOOL!**



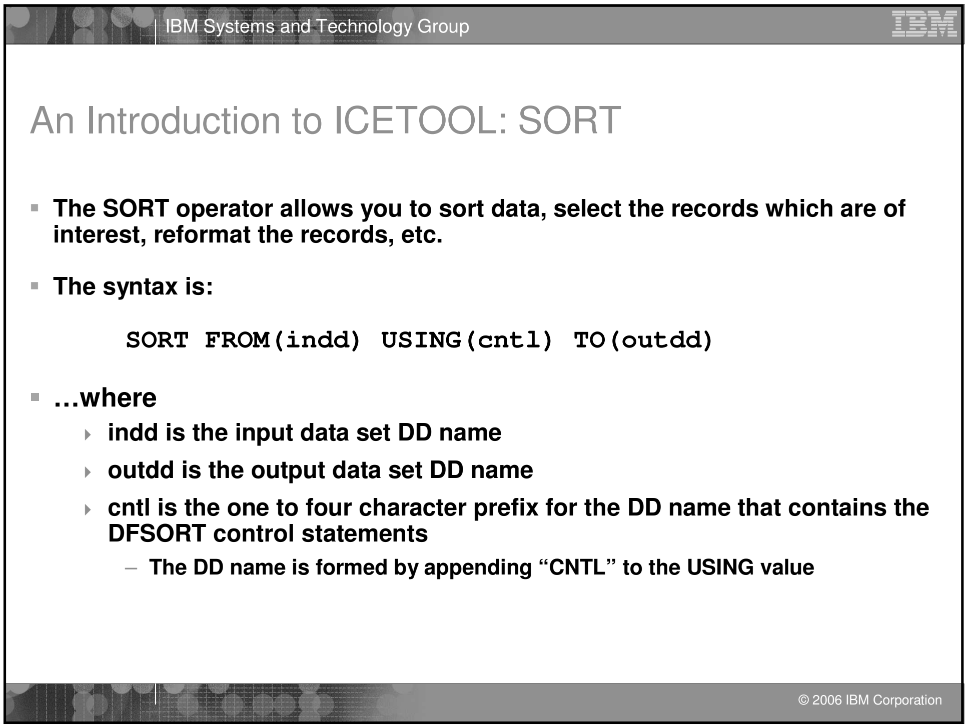
An Introduction to ICETOOL: ICETOOL Operators

ICETOOL Operator	Description
COPY	Copies a data set to one or more output data sets.
COUNT	Counts the records in a data set or sets a return code based on the count.
DEFAULTS	Prints the DFSORT installation defaults.
DISPLAY	Print fields values with titles, headings, sections, etc.
MODE	Sets the ICETOOL error option: STOP, CONTINUE or SCAN. STOP is the default.
OCCURS	Print field values and their counts with titles, headings, etc.
RANGE	Prints the count of values in a specified range.
SELECT	Selects records based on value counts.
SORT	Sorts a data set to one or more output data sets.
SPLICE	Performs various join and match operations.
STATS	Prints minimum, maximum, total, and average values.
UNIQUE	Prints a count of unique values.
VERIFY	Identifies invalid decimal values.



An Introduction to ICETOOL: ICETOOL Operators…

- **All of the sample ICETOOL reports that are shipped in member IRRICE of ‘SYS1.SAMPLIB’ were written using just these ICETOOL operators:**
  - **COPY**
  - **SORT**
  - **DISPLAY**
  - **OCCURS**

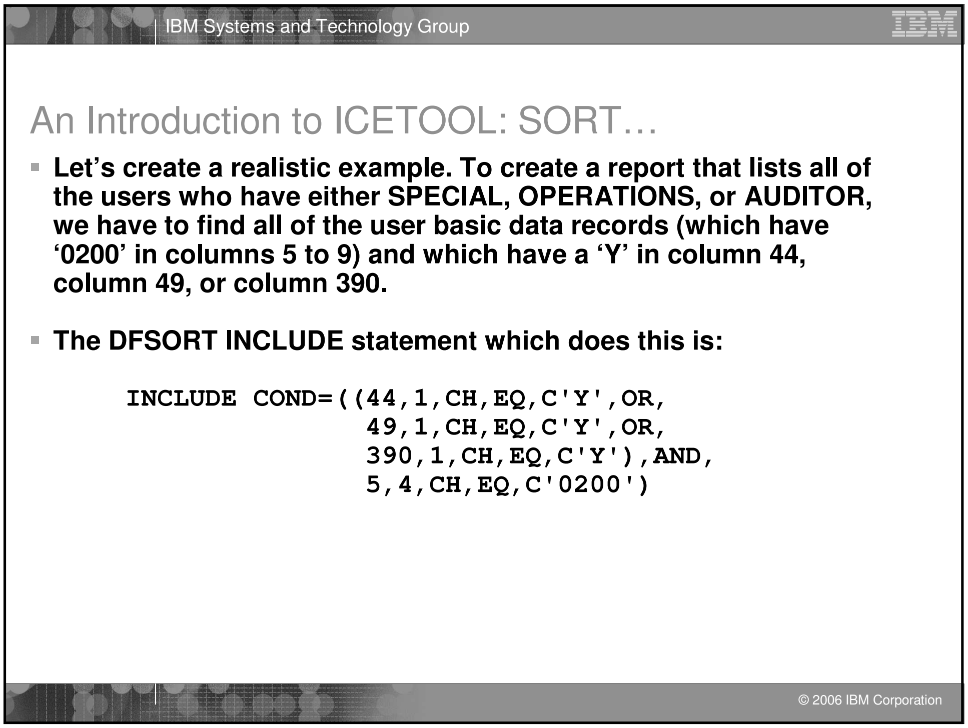


An Introduction to ICETOOL: SORT

- **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)
```

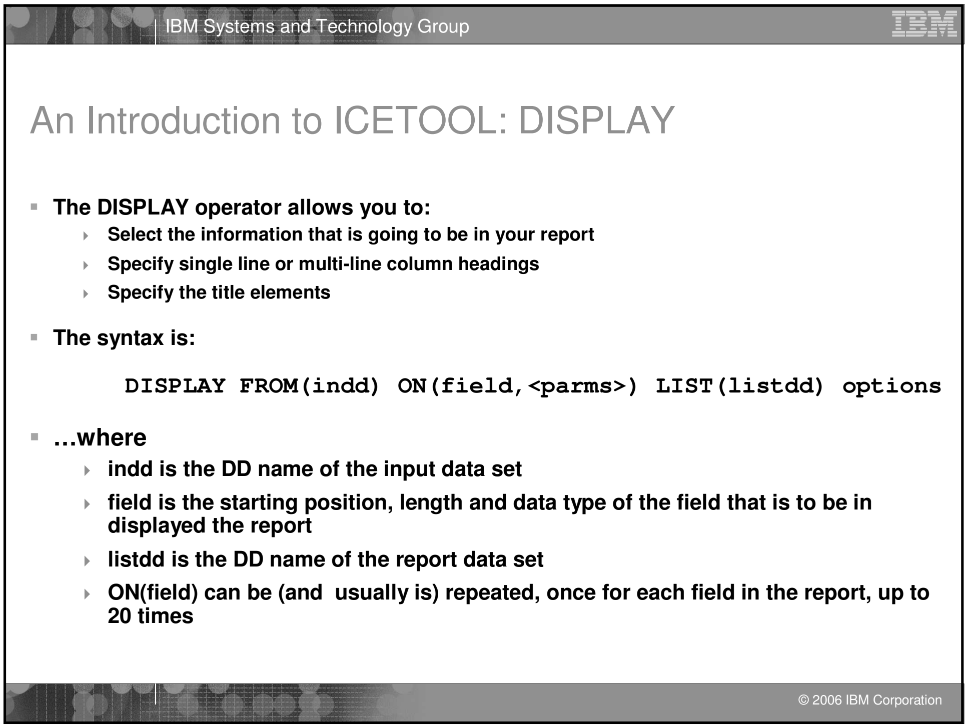
- **…where**
  - **indd is the input data set DD name**
  - **outdd is the output data set DD name**
  - **cntl is the one to four character prefix for the DD name that contains the DFSORT control statements**
    - **The DD name is formed by appending “CNTL” to the USING value**



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:**

```
INCLUDE COND=((44,1,CH,EQ,C'Y',OR,
               49,1,CH,EQ,C'Y',OR,
               390,1,CH,EQ,C'Y'),AND,
               5,4,CH,EQ,C'0200')
```

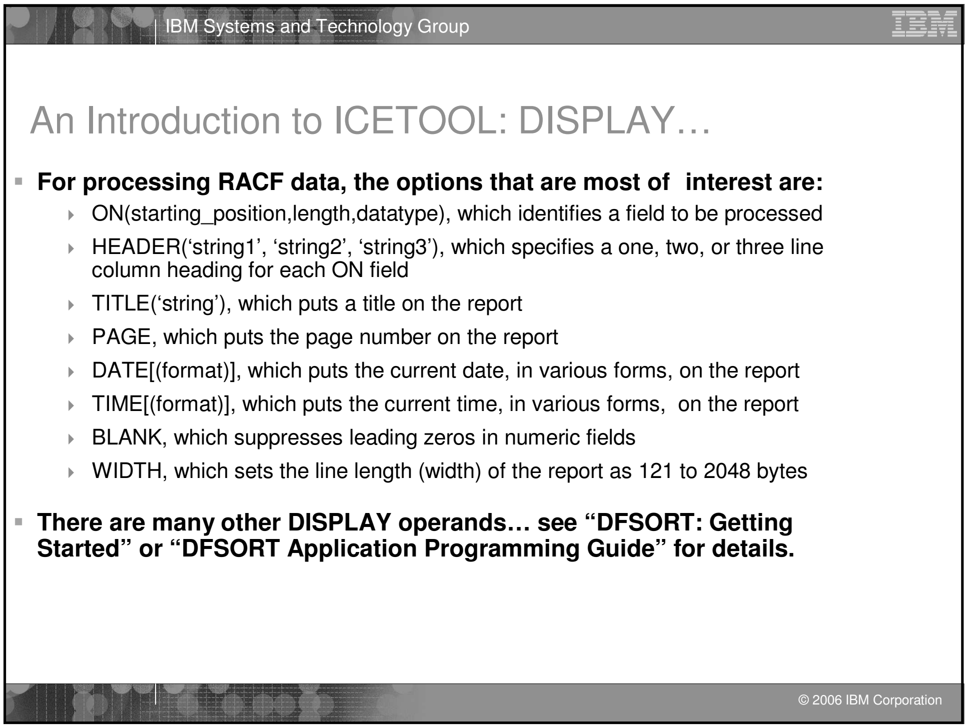


An Introduction to ICETOOL: DISPLAY

- **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**
  - **field is the starting position, length and data type of the field that is to be in displayed the report**
  - **listdd 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**



An Introduction to ICETOOL: DISPLAY…

- **For processing RACF data, the options that are most of interest are:**
  - ON(starting_position,length,datatype), which identifies a field to be processed
  - HEADER('string1', 'string2', 'string3'), which specifies a one, two, or three line column heading for each ON field
  - TITLE('string'), which puts a title on the report
  - PAGE, which puts the page number on the report
  - DATE[(format)], which puts the current date, in various forms, on the report
  - TIME[(format)], which puts the current time, in various forms, on the report
  - BLANK, which suppresses leading zeros in numeric fields
  - WIDTH, which sets the line length (width) of the report as 121 to 2048 bytes
- **There are many other DISPLAY operands… see "DFSORT: Getting Started" or "DFSORT Application Programming Guide" for details.**

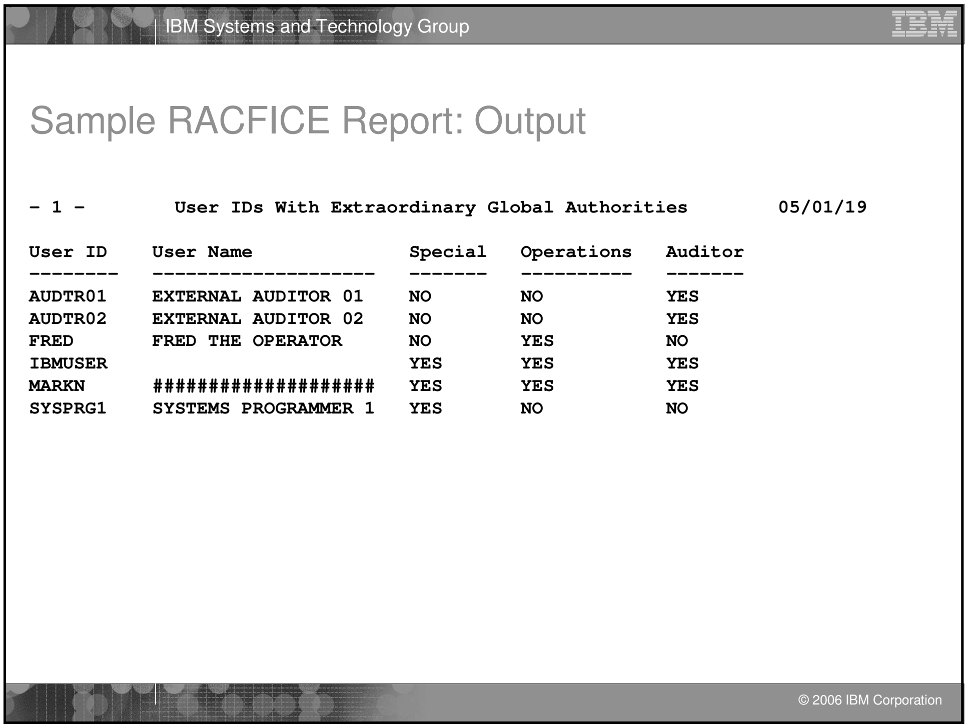
An Introduction to ICETOOL: DISPLAY…

- **Continuing our example: To create a report which lists all of the users who have either SPECIAL, OPERATIONS, or AUDITOR, along with their name (from columns 79 to 98) and their user ID (from columns 10 to 17), you code this ICETOOL DISPLAY operator:**

```
DISPLAY FROM(TEMP0001) LIST(PRINT) -
        PAGE -
        TITLE('User IDs With Extraordinary Global Authorities')-
        DATE(YMD/) -
        TIME(12:)  -
        BLANK -
        ON(10,8,CH)  HEADER('User ID') -
        ON(79,20,CH) HEADER('User Name') -
        ON(44,4,CH)  HEADER('Special') -
        ON(49,4,CH)  HEADER('Operations') -
        ON(390,4,CH) HEADER('Auditor')
```

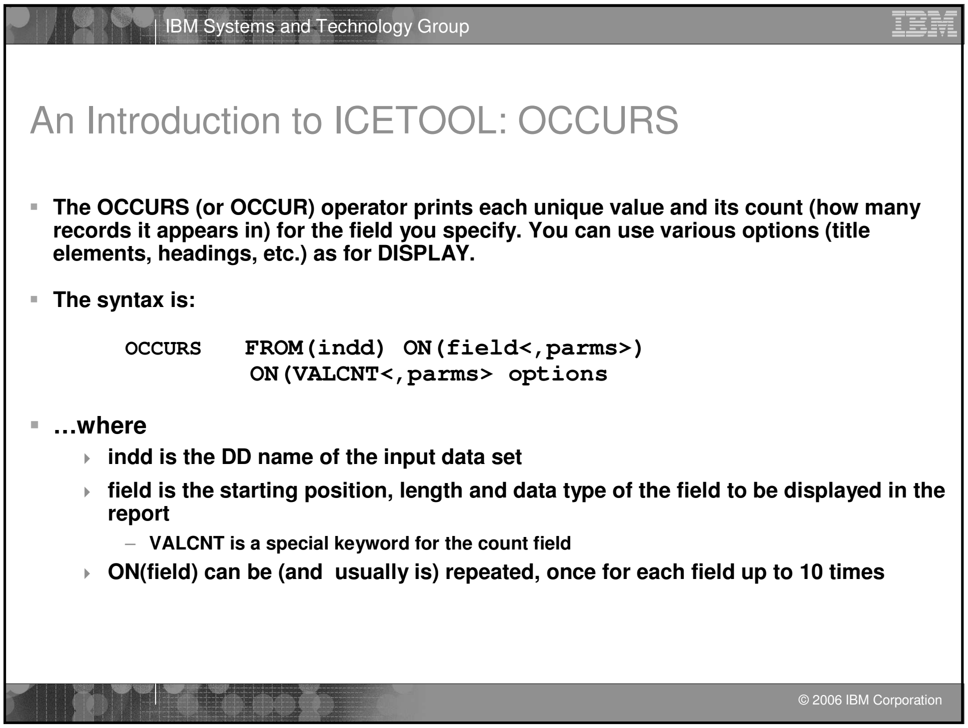
An Introduction to ICETOOL: JCL

```
//REPORT    EXEC PGM=ICETOOL
//TOOLMSG   DD SYSOUT=*
//DFSMSG    DD SYSOUT=*
//DBUDATA   DD DISP=(SHR,DELETE),DSN=USER01.IRRDBU00
//TEMP0001  DD DISP=(NEW,DELETE),SPACE=(CYL,(5,1,0)),UNIT=SYSALLDA
//PRINT     DD SYSOUT=*
//TOOLIN    DD *
 SORT    FROM(DBUDATA) TO(TEMP0001) USING(RACF)
 DISPLAY FROM(TEMP0001) LIST(PRINT) -
        PAGE -
        TITLE('User IDs With Extraordinary Global Authorities') -
        DATE(YMD/) -
        TIME(12:)  -
        BLANK -
        ON(10,8,CH)  HEADER('User ID') -
        ON(79,20,CH) HEADER('User Name') -
        ON(44,4,CH)  HEADER('Special') -
        ON(49,4,CH)  HEADER('Operations') -
        ON(390,4,CH) HEADER('Auditor')


/*
//RACFCNTL  DD *
 SORT    FIELDS=(5,8,CH,A)
 INCLUDE COND=((44,1,CH,EQ,C'Y',OR,
               49,1,CH,EQ,C'Y',OR,
              390,1,CH,EQ,C'Y'),AND,
              5,4,CH,EQ,C'0200')
/*
```



Sample RACFICE Report: Output

```
- 1 -        User IDs With Extraordinary Global Authorities        05/01/19

User ID    User Name             Special   Operations   Auditor
--------   --------------------  -------   ----------   -------
AUDTR01    EXTERNAL AUDITOR 01   NO        NO           YES
AUDTR02    EXTERNAL AUDITOR 02   NO        NO           YES
FRED       FRED THE OPERATOR     NO        YES          NO
IBMUSER                          YES       YES          YES
MARKN      ####################  YES       YES          YES
SYSPRG1    SYSTEMS PROGRAMMER 1  YES       NO           NO
```

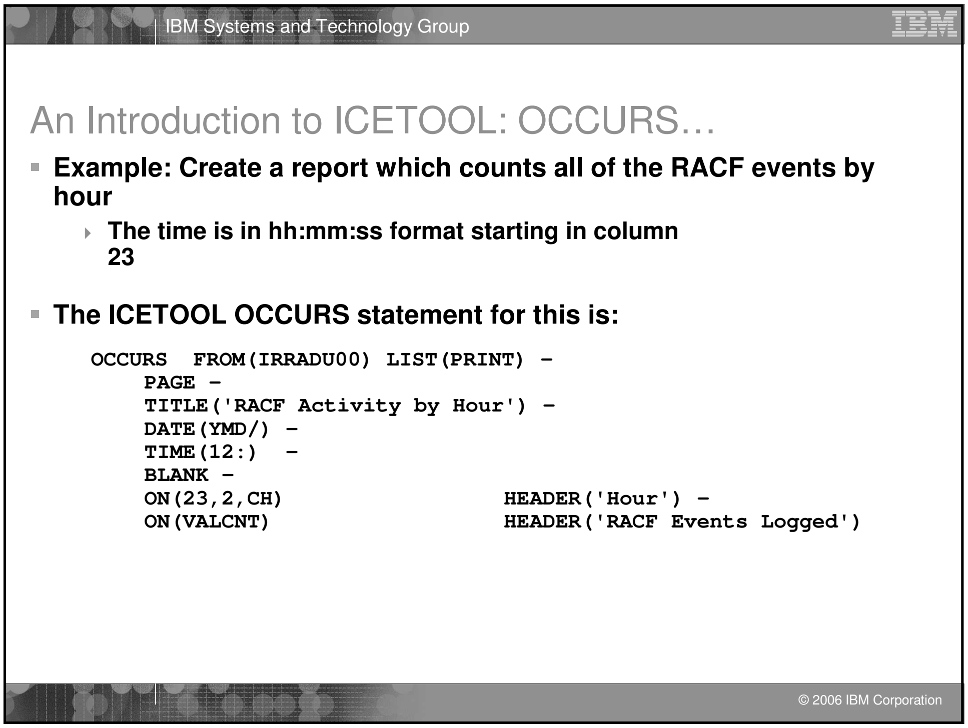


An Introduction to ICETOOL: OCCURS

- **The OCCURS (or OCCUR) operator prints each unique value and its count (how many records it appears in) for the field you specify. You can use various options (title elements, headings, etc.) as for DISPLAY.**
- **The syntax is:**

```
OCCURS   FROM(indd) ON(field<,parms>)
          ON(VALCNT<,parms> options
```

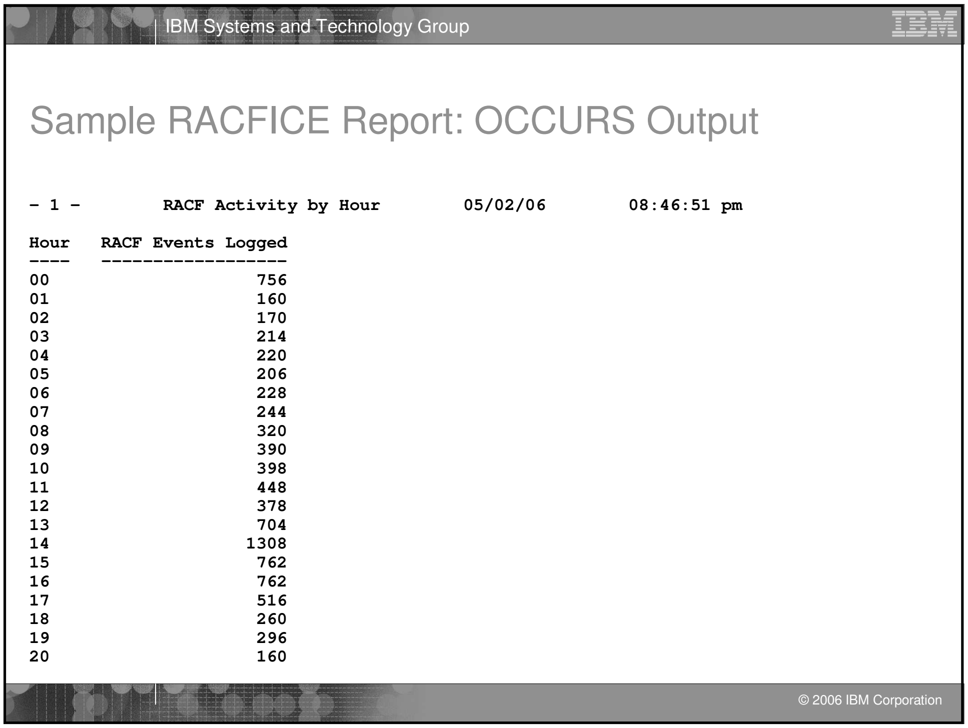
- **…where**
  - **indd is the DD name of the input data set**
  - **field is the starting position, length and data type of the field to be displayed in the report**
    - **VALCNT is a special keyword for the count field**
  - **ON(field) can be (and usually is) repeated, once for each field up to 10 times**



An Introduction to ICETOOL: OCCURS…

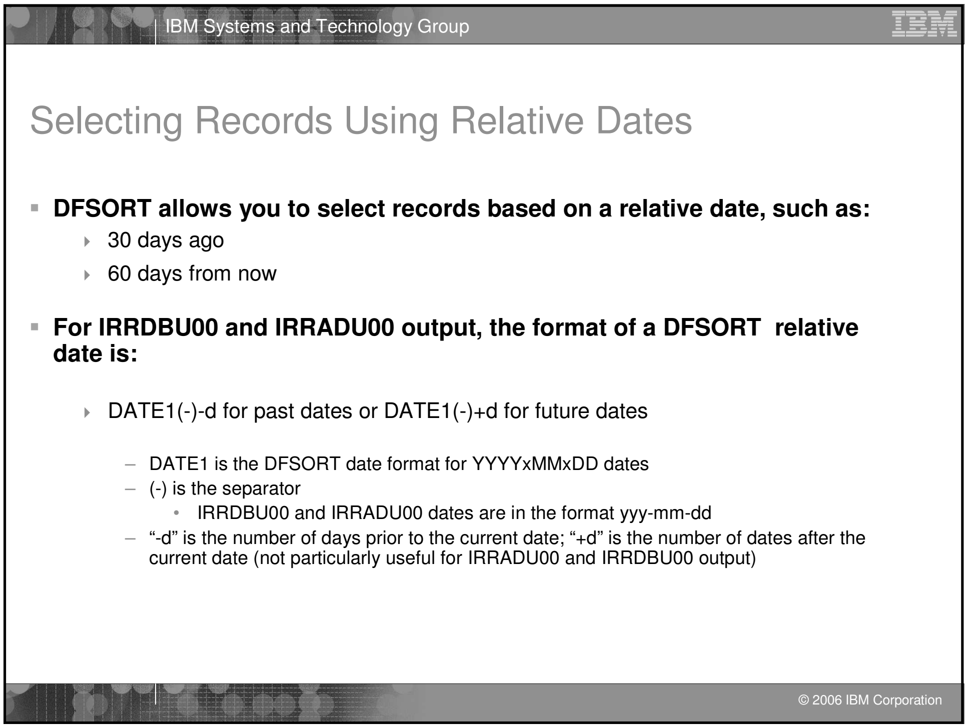
- **Example: Create a report which counts all of the RACF events by hour**
  - **The time is in hh:mm:ss format starting in column 23**
- **The ICETOOL OCCURS statement for this is:**

```
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')
```



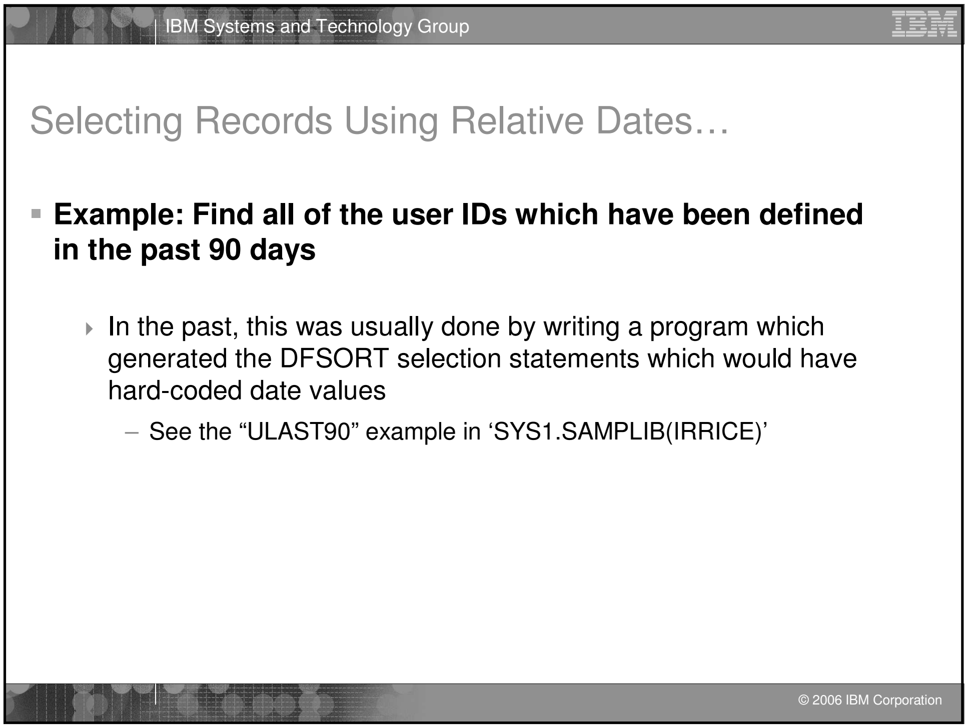
Sample RACFICE Report: OCCURS Output

```
- 1 -        RACF Activity by Hour        05/02/06        08:46:51 pm

Hour   RACF Events Logged
----   ------------------
00                    756
01                    160
02                    170
03                    214
04                    220
05                    206
06                    228
07                    244
08                    320
09                    390
10                    398
11                    448
12                    378
13                    704
14                   1308
15                    762
16                    762
17                    516
18                    260
19                    296
20                    160
```



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)



Selecting Records Using Relative Dates…

- **Example: Find all of the user IDs which have been defined in the past 90 days**
  - In the past, this was usually done by writing a program which generated the DFSORT selection statements which would have hard-coded date values
    - See the “ULAST90” example in ‘SYS1.SAMPLIB(IRRICE)’

Selecting Records Using Relative Dates…

- **DFSORT INCLUDE Statement:**

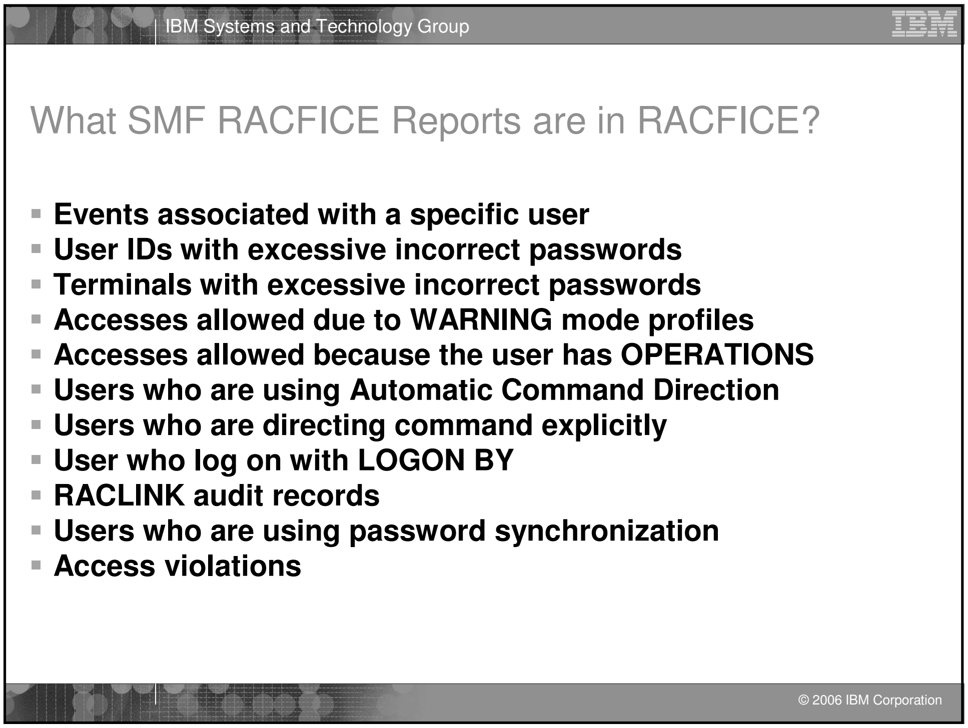
```
SORT    FIELDS=COPY
INCLUDE COND=(5,4,CH,EQ,C'0200',AND,
19,10,CH,GE,DATE1(-)-90)
  OPTION  VLSHRT
```

- **Output:**

```
1- 1 -        UL90: User IDs defined in the past 90 days        06/05/25        06:30:06 pm

 Date         User ID    Owner      Special   Operations   Auditor   Last Date    Last Time
 ----------   --------   --------   -------   ----------   -------   ----------   ---------
 2006-05-25   MARKN      IBMUSER    YES       YES          YES       2006-05-25   15:13:58
 2006-03-28   OMVSKERN   IBMUSER    NO        NO           NO        2006-03-28   10:32:45
 2006-04-05   ZOS17      IBMUSER    NO        NO           NO        2006-04-05
```

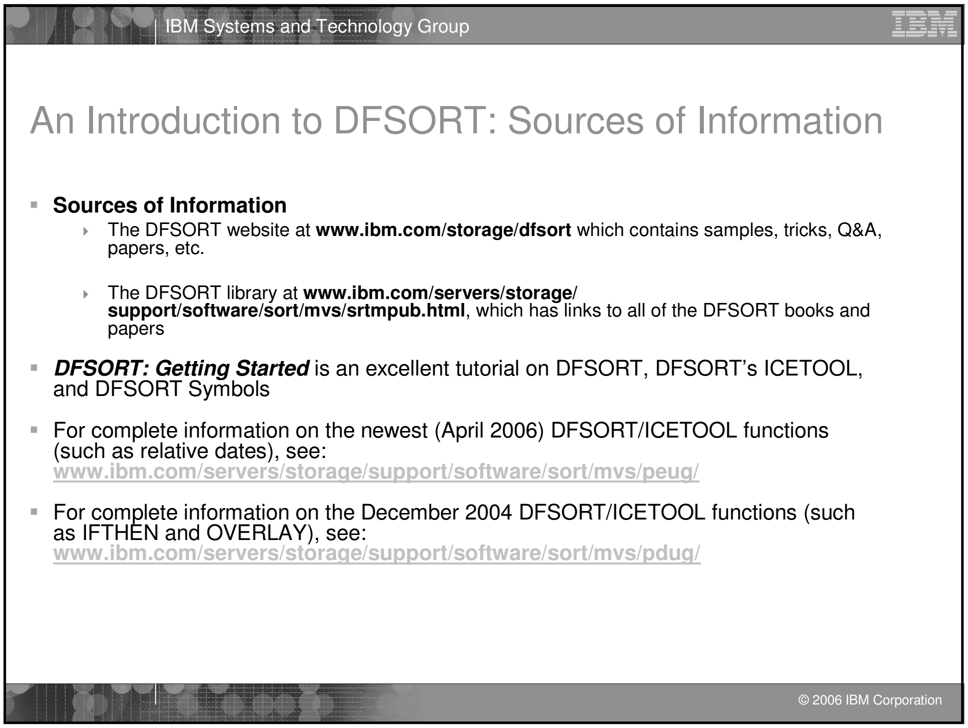
What RACF DB Reports Are in RACFICE?

- **Users who have extraordinary global/group RACF attributes**
- **Discrete data set/general resource profiles which contain generic characters**
- **Users who have more than 20 group connections**
- **Count of user/group/data set/general resource (by class) profiles**
- **User IDs with group privileges above USE**
- **Data set standard and general resources with a UACC of other than NONE**
- **Data set standard and conditional access lists with ID(*) of other than NONE**
- **General resource standard and conditional access lists with ID(*) of other than NONE**
- **Users who have explicit RRSF associations defined**
- **User IDs with an OMVS segment**
- **OS/390 UNIX super users (UID of zero)**
- **OS/390 UNIX UIDs which are used more than once**
- **HLQs with excessive generic profiles**
- **HLQs with excessive fully-qualified generic profiles**
- **User profiles defined in the past 90 days**



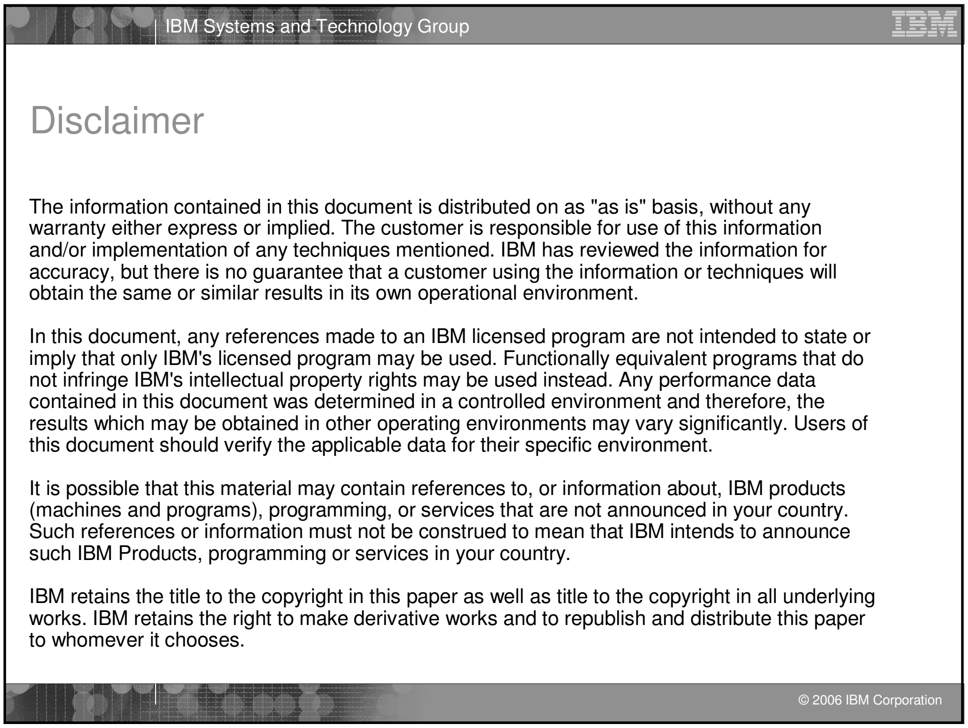
What SMF RACFICE Reports are in RACFICE?

- **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**



An Introduction to DFSORT: Sources of Information

- **Sources of Information**
  - The DFSORT website at **www.ibm.com/storage/dfsort** which contains samples, tricks, Q&A, papers, etc.
  - The DFSORT library at **www.ibm.com/servers/storage/support/software/sort/mvs/srtmpub.html**, which has links to all of the DFSORT books and papers
- ***DFSORT: Getting Started*** is an excellent tutorial on DFSORT, DFSORT's ICETOOL, and DFSORT Symbols
- For complete information on the newest (April 2006) DFSORT/ICETOOL functions (such as relative dates), see: **www.ibm.com/servers/storage/support/software/sort/mvs/peug/**
- For complete information on the December 2004 DFSORT/ICETOOL functions (such as IFTHEN and OVERLAY), see: **www.ibm.com/servers/storage/support/software/sort/mvs/pdug/**



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