Suprtool

High Speed Database Extract for HP 3K/9K

Training Workbook

Objectives of this course

- Learn what Suprtool can do for you
- Learn the basic commands, variations, options, and syntax
- Learn advanced techniques
- Apply what you’ve just learned; get hands-on experience

Basic Modules

- Module 1 - Introduction to Suprtool
- Module 2 - Working with databases
- Module 3 - HPEloquence Issues and Introduction
- Module 4 - Working with Disc Files
- Module 5 - Selecting Records
- Module 6 - Working with Suprlink

More On Suprtool

- Module 7 - Exporting Data to the World
- Module 8 - Extract command
- Module 9 - Latest Features
- Module 10 - Programming with Suprtool2

Optional Modules

- Optional - Working with Speed Demon (MPE only)
- Optional - PowerHouse
- Optional - Editing TurboIMAGE Datasets (MPE only)
- Optional - HowMessy (Turbo-Image only)

Course Material and Structure

- Copies of all the Instructor’s slides are in this workbook
- Refer to the notes below for more details
- Key concepts are repeated multiple times
- Hands-on exercises to apply new knowledge
- Take notes, draw pictures and diagrams to reinforce new information
- Course should be interactive, with a focus on applying techniques to *your* requirements and applications

Your requests drive Suprtool development...

- Requests are logged in a Knowledge Base
- R&D answers the phone and takes support calls
- Support and R&D personnel exchange ideas via e-mail
- There is *always* a new version in the works
- **Sales 1-604-501-2001**
- **Support 1-800-453-8970** Office hours are from
  8 a.m. - 4 p.m. Pacific time
  Monday - Friday
- E-mail: support@robelle.com

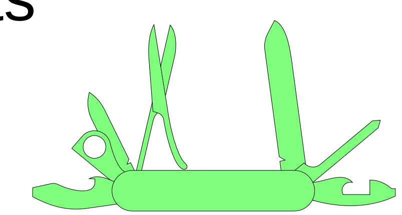
Communicating with you

- Change notice with every release
- User group meetings
- World Wide Web: http://www.robelle.com/
  (or www.suprtool.com)
- support@robelle.com (Direct e-mail to Support)

Inside Module 1

What is Suprtool?

- It is a software tool for the HP 3000 and HP 9000
- It extracts data quickly
- It does many data processing functions for files and databases: copies, selects, and sorts, reformats, prints
- It links data from several files into one
- It provides *FAST* serial processing of “flat” files, KSAM files, TurboIMAGE, Oracle, Allbase and Eloquence databases



What is in Suprtool?

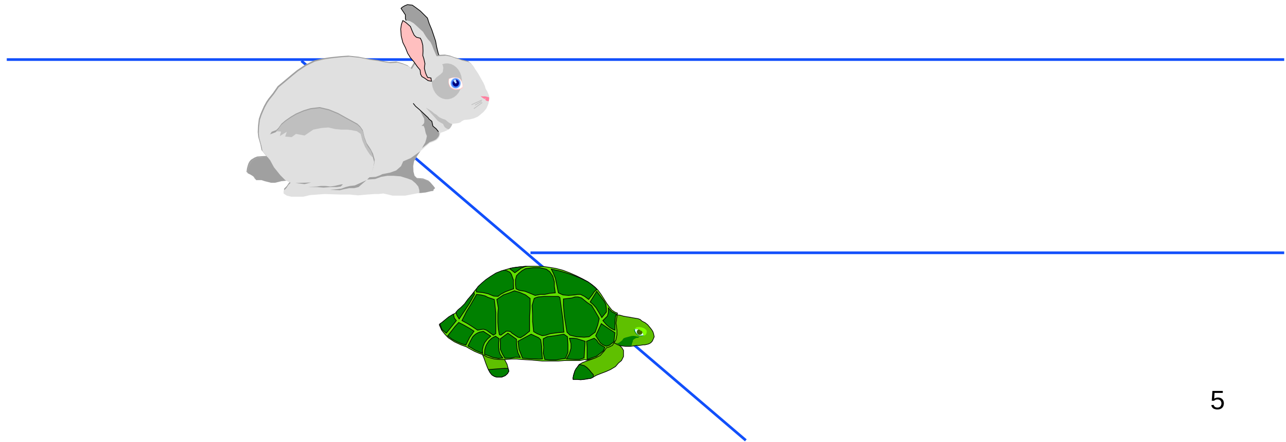
- Suprtool has six components on MPE and four on HP-UX:
    1. Suprtool - main program
    2. Suprlink - linking program
    3. STExport - exporting program
    4. Dbedit - TurboIMAGE editing utility (MPE only)
    5. Speed Demon - TurboIMAGE extracting routines (MPE only)
    6. Suprtool2 - interface routines
- Documentation on web site.

Why use Suprtool?

- It’s speedy
- It has powerful, easy to use command syntax
- It maximises machine resources
- Its simple commands mean FAST programming
- It integrates well with other tools
- It has powerful reformatting functions

Why is Suprtool/iX so much faster?

- Traditional reports gather information in an inefficient way
- Suprtool uses serial scans to retrieve records in the order they are stored on the disk
- Suprtool sorts data more quickly than the system sort
- Suprtool can quickly extract, sort, and merge information from many sources



Some Suprtool Commands

Process	Suprtool Commands
Specify source of records	BASE, GET, INPUT, CHAIN, OPEN, SELECT
Select records	IF, TABLE, CHAIN
Sort the selected records	SORT, KEY
Specify fields for output	EXTRACT
Other optional steps	DELETE, DUPLICATE, TOTAL,CLEAN
Define destination of records	OUTPUT, PUT, LIST, UPDATE, ADD

What is a task?

- A task is Suprtool’s basic unit of work
- A task has one source of records and one destination for output records
- A task is executed using the XEQ or EXIT commands
- A task can be canceled or reset by using the RESET or EA commands
- The job you are doing may require multiple tasks

Getting into Suprtool

- To get into Suprtool for MPE, you simply use the RUN command

```
:run suprtool.pub.robelle
```

- To get into Suprtool for HPUX you simply type:

```
/opt/robelle/bin/suprtool
```

Copying an entire dataset to a file

- Use the BASE command to access a database and copy dataset to a file

```
>base store,5,reader
>get d-sales
>output salesout
>xeq
```

- By default, Suprtool creates a new output file

Copying a subset of records to a file

- Use the IF command to select records from a dataset

```
>get d-inventory
>if on-hand-qty < 5
>list standard
>output testfile
>xeq
```

Looking at the contents of a file

- You can look at any file using INPUT and OUTPUT
- Beware of unprintable characters

```
>input lowstock
>output *
>xeq
159   ,19970828   ,1         ,50532001 ,5053     ,94.49
133   ,19971016   ,1         ,50522001 ,5052     ,80.59
138   ,19971016   ,4         ,50522501 ,5052     ,41.53
107   ,19970812   ,2         ,50512001 ,5051     ,146.39
111   ,19970916   ,3         ,50513001 ,5051     ,128.99
IN=5, OUT=5. CPU-Sec=1. Wall-Sec=1.
```

Exercise
Copying the m-customer dataset

- Open the Store database and copy the m-customer dataset into a file called Custfile:

```
> base store,1,WRITER
> get m-customer
> output custfile
> xeq
```

- Then look at the contents of Custfile

```
> input custfile
> list
> xeq
```

- Repeat, but create a “link” file:

```
> output custfile,link
```

First Rule of output:

*“Unless you have a really good reason not to, __**always**__ make your output files self-describing”*

```
> output myfile,link
```

Getting out

There are 4 ways to complete a task:

- XEQ - executes task, remains in Suprtool
- EXIT- executes task, exits Suprtool, suspending if possible
- EXIT ABORT (EA) - cancels task, terminates and exits Suprtool
- EXIT SUSPEND (ES) - puts task “on hold”, suspends and exits Suprtool

Redoing a task

- A task can be easily corrected and repeated if a mistake has been made

- Use these commands to avoid retyping long lists of commands:

  LISTREDO
  REDO
  DO
  BEFORE
  MPEX abbreviations

```
>do if
>if on-hand-qty < 5
>
```

Do, Redo, and Listredo

- DO re-executes the last command or any prior command, as-is
- REDO re-executes the last command or any prior command after making changes to the command
- LISTREDO
  - List some prior commands, to the screen or to a file
  - Useful for saving work to a file that may become a script

```
>do
>do 5/10
>redo in
>listredo all;unn;out=savefile
```

Getting on-line Help

- Try these Help keywords to access the user manual:

  Help

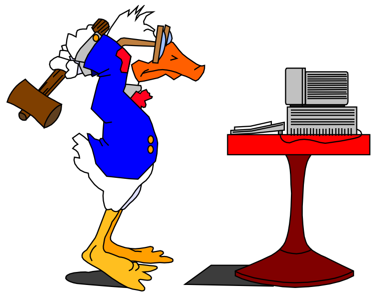
  Help Intro

  Help News

  HQ

  HQ List

- Press “+” to show the Help tree, which lists Help keywords hierarchically



Command conventions

- No command line may be over 256 characters
- Separate multiple commands on the same line with semi-colon **;**
- Continue a long line to the next line by ending it with ampersand &
- Append comments to commands using braces {comment}

```
>base store,5,reader  {read access only}
>get d-sales; item deliv-date,date,yyyymmdd
>if deliv-date < $today(-30) and product-no = 123456,&
>>234567,345678
```

Execute sequences of commands - Use

- Save a set of commands in a file
- Use the file to execute all the commands
- Create usefiles of DEFINE and ITEM commands for datasets and flat files
- Create usefiles with LISTREDO
- Suppress listing the commands with USEQ
- Suprmgr.Pub.Sys or /opt/robelle/suprmgr are always used at startup
- Use files can be “nested”

Set and Verify options

- Enable or disable processing options using SET
- Check the current state of affairs using VERIFY
- Put SET commands for all tasks in Suprmgr files

Using OS commands within Suprtool

- If Suprtool and the OS do not have the same command name, a leading colon is optional with OS commands. For example,

  `>:showtime` is equivalent to `>showtime` {only MPE}

  `>:reset` is not the same as `>reset` {MPE and Suprtool}

- OS commands cannot be abbreviated

- On MPE, you can execute :Run, Command Files, and User Defined Commands (UDC) inside Suprtool

- No more OS commands can be executed in Suprtool after the SET LIMITS MPE OFF command

Run Suprtool on MPE

- **`Parm=4; Info="use foo.defs"`**
  Execute Info string once at startup **`UX: -c“use foo.defs”`**
- **`Parm=8; Info="use doit"`**
  Execute Info string upon each re-activation
- **`Parm=16`**
  Copy the input file to the output file
- **`Parm=32`**
  Terminate completely; don’t suspend
- **`Parm=64`** **`UX: suprtool -v`**
  Check with user before exiting

Running Suprtool for HP-UX

- Options entered in normal HP-UX conventions
- suprtool [-cv -oc]
- -c”use usefile”
- -v {Verify exit }
- -oc { sets .stoutcount }
    - if [`cat .stoutcount` -ge 10]; then
    - echo “More than 10 records found”
    - fi

Quick Vocabulary

- database
- dataset
- EXTRACT
- EXIT
- file
- GET
- IF
- LIST
- OUTPUT
- REDO
- record
- SORT
- task
- XEQ

Summary

- Six Suprtool components on MPE four on HP-UX
- Documentation and helpful web site.
- Fast processing
- Edit data interactively on MPE
- Basic Suprtool tasks
- On-line Help

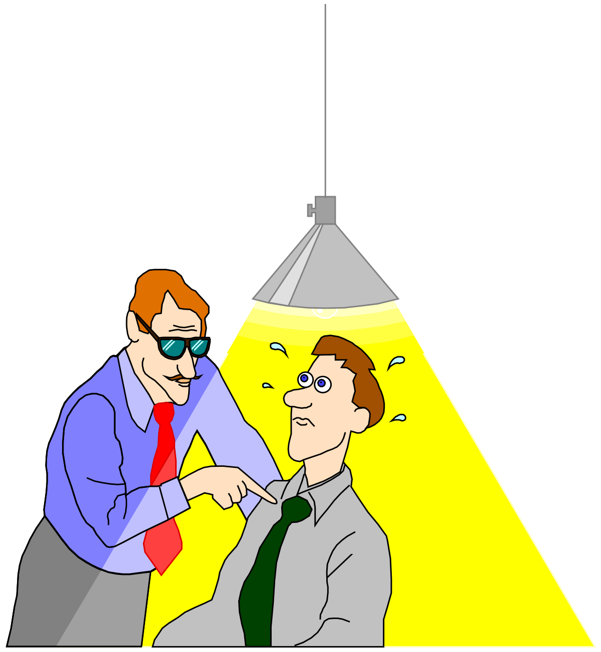
Inside Module 2

Working with Databases

Accessing data files

- These Suprtool commands access TurboIMAGE and Eloquence datasets:

BASE	GET
CHAIN	FORM
PUT	DELETE
UPDATE	



Opening and closing a database (Image)

- You can use the BASE command to open a database

```
>base store,5,READER
```

- The BASE command without parameters closes a database

- A database remains open until a BASE, RESET BASE or RESET ALL command is executed

- Eloquence Base command is slightly different; see module 3

How to find datasets in a database

- Use the FORM SETS command to display datasets

```
>base store.demo
Database password[;]?
>form sets
Database:STORE.DEMO.APPDEV TPI: SUPERDEX(15015d) 4.0.39
           Set      Item  Capa- Entry Load   Entry
Sets:      Num Type Count city  Count Factor Length B/F
M-CUSTOMER 1   M    9     211   12    9 %    55     7
M-PRODUCT  2   M    2     307   13    4 %    24     12
M-SUPPLIER 3   M    6     211   3     1 %    49     8
D-INVENTORY4   D    6     462   13    3 %    15     22
D-SALES    5   D    8     602   8     1 %    19     14
```

More about the Form command

- The FORM command without parameters first defaults to the current input dataset. If no input has been specified, then it defaults to FORM SETS.

- All output is written to the Formout file, which can be redirected to a line printer or a disc file. Currently the Formout file is not available on HP-UX.

Datasets as input sources

- The GET command reads a dataset in one of several ways
  - It can read the <u>entire</u> dataset serially
  - It can read a <u>subset</u> of dataset records serially
  - It can read records at a specified interval (e.g., every 5th record). This kind of sampling is useful for test purposes.
- A database must be open before you can use the GET command

Warnings using Get

- Suprtool checks the dataset entry count before and after processing, and warns you if it has changed.
- Suprtool permits concurrent changes, but warns you when this happens. If you need exclusive access, open the database in mode-4.
- If you repeatedly receive warnings of new entries, use the SET EOFREAD ON command to read to end-of-file. (Must be specified before the GET command!)

Determining fields in a dataset

- Use FORM *setname* to display the fields in a dataset

```
>form m-customer

M-CUSTOMER      MASTER    SET 1
  Entry:                   Offset
    CITY                  X12     1
    CREDIT-RATING         J2      13
    CUST-ACCOUNT          Z8      17   <<SearchField>>
    CUST-STATUS           X2      25
    NAME-FIRST            X10     27
    NAME-LAST             X16     37
    STATE-CODE            X2      53
    STREET-ADDRESS       2X25     55
    ZIP-CODE              X6      105

Capacity:211 (7)  Entries:20  Bytes:110
```

Defining New Fields

- Create new field definitions:

```
    > define D-STATUS,25,1,CHAR
```

- ABSOLUTE definition:

  define *field,byteposition,length*[,*type*]

  e.g. `> define ord-total,20,4,integer`

- RELATIVE definition:

  define *field,fieldname*[*(subscript)*][*[offset]*],*length*[,*type*]

  e.g. `> define branch-no,cust-code[1],2`

Relative defines are associated with a record item, so will stay correct if the field sequence changes.

Reading specific data chains

- If you know the key value(s), use the CHAIN command to search a dataset and select records with the specified key

```
>chain d-sales,customer = “123456”

>chain dtrans,partnum = “A123”,“B654”,“G999”

>chain d-sales,customer = slist     {use a table}
```

- Even when you know the key values, the GET command may select the same records faster than CHAIN can

```
>get d-sales; if $lookup(slist, customer)
```

Get versus Chain command

GET	**CHAIN**
Serial access	Keyed access
Any dataset	Only keyed datasets
All records	Only records with key values
Physical order	Forward chain pointers
MR NOBUF reads	DBFIND and DBGET mode-5 and -7
Selection by any data fields	Selection by key field

Exercise 1
Get versus Chain: quick, choose one!

- Your task is to retrieve records from the infamous ord-line detail dataset which contains 2.3 million records of 308 bytes each. The key values to be selected are in a file called Ordfile. These 162,000 ord-num field values will select 261,000 records from the dataset.

- Your mission, Jim, should you decide to accept it, will be to access the records as quickly as possible, using either the GET command or the CHAIN command. The final results must be sorted in ord-num sequence.

- As always, should you fail, the Secretary will disavow all knowledge of your actions.

Listing data from datasets

- Use the LIST command without parameters to list records whose format is known

```
>get m-customer
>list
>xeq
```

```
>GET M-CUSTOMER (1) >OUT $NULL (0)
CITY           = Edmonton  CREDIT-RATING   = 240000
CUST-ACCT      = 10005     CUST-STATUS     = 30
NAME-FIRST     = Terry     NAME-LAST       = Coyle
STATE-CODE     = AL
```

Changing Field Structure of Output

- By default ***all*** fields in the input record are copied to the output record.
- The EXTRACT command overrides this default.
  extract *field* [*(subscript)*][=*value*][,....]
  extract *field1\field2*
- Can have multiple EXTRACT commands
- Up to 255 extracted fields
- Can specify fieldnames, constants, strings
- Output record will be assembled with fields in the same sequence as the EXTRACT commands.

Extract example .....

```
>get m-customer
>extract name-first, name-last
>extract " City: "
>extract city
>output *
>xeq
Wayne     Humphreys        City: Vancouver
Elizabeth Welton           City: Coquitlam
William   Kirk             City: Richmond
Jack      Morrison         City: Calgary
James     Young            City: Edmonton
Percy     Ferguson         City: Coquitlam
Walley    Nisbet           City: Surrey
……..
```

A quick way to produce basic reports

- Use the LIST STANDARD command to produce a report with a predefined format

```
Feb 03, 1996  Base STORE.DEMO Set M-CUSTOMER   Page 1
CUST-ACCO  CITY         NAME-FIRST    NAME-LAST
10004      Edmonton     Arthur        Rogers
10005      Edmonton     Terry         Coyle
10015      Edmonton     James         Young
10016      Edmonton     Tara          Bamford
IN=4, OUT=4.  CPU-SEC=1.  WALL-SEC=1.
```

Suprtool lets you customize reports

You can modify reports to improve their appearance or functionality by doing the following:

- changing the report title
- changing heading names
- changing the sort key to make the report contents more meaningful

Customizing a report title and column headings

- It is easy to change your report title or column headings

```
>get m-customer
>if city = "Edmonton"
>sort name-last
>list standard,title "Customers in Edmonton",&
>> heading "Customer Name          ",&
>>      "City         ",&
>>      "Account"
>ext name-last,name-first,city,cust-account
>xeq
```

MPE/iX third-party indexing

- Requires Omnidex or Superdex indexing software or HP B-tree support (not currently supported in Suprtool/UX)
- CHAIN command can access third-party or IMAGE indexes

```
>chain m-customer,name-last = "A@"
```

- FORM command marks IMAGE fields with third-party indexing as "<<TPI>>", and B-trees as "<<Indexed>>"
- VERIFY BASE command displays name and version of indexing software

Form command shows third-party indexes

```
>form m-customer

M-CUSTOMER         Master     Set#1
  Entry:                Offset
   CITY             X12    1  <<TPI>>
   CREDIT-RATING    J2    13
   CUST-ACCOUNT     Z8    17  <<SearchField>>
                              <<TPI>>
   CUST-STATUS      X2    25
   NAME-FIRST       X10   27  <<TPI>>
   NAME-LAST        X16   37  <<TPI>>
   STATE-CODE       X2    53  <<TPI>>
   STREET-ADDRESS  2X25   55
   POSTAL-CODE      X6   105
Capacity: 211  Entries:20  Entry Length:55 Blocking:7
```

Exercise 2
Create a listing of the Alberta customers

- Create the following report from the STORE database:

```
Mar 20, 1996 20:32      Alberta Customers       Page 1

Account#   Name                 City
   10004   Rogers               Edmonton
   10005   Coyle                Edmonton
   10006   Frahm                Calgary
   10007   Tiernan              Calgary
   10015   Young                Edmonton
   10016   Bamford              Edmonton
   10017   Morrison             Calgary
   10018   Johnston             Calgary
```

Changing data in datasets

- The Put, Delete and Update commands make changes to the contents of a dataset
- You must open the database in mode 1, 2, 3, or 4
- You can disable the Put, Delete, and Update functions via the Set Limits ReadOnly command

```
>set limits readonly on
```

Moving data into datasets

- We recommend this set of commands to perform a major load of a dataset from a file

```
>input loadfile
>set dumponerror on            {default}
>set defer on
>set ignore on
>put m-cust,store.pub,3
>xeq
```

- Input file record structure must match the destination dataset structure *exactly!*

What if the data doesn’t match exactly?

- Use EXTRACT commands to construct the output record

- Use DEFINE and EXTRACT to change storage formats:

```
> define amount,1,8,display {...in input file}
> define new-amount,1,4,integer {new field}
> extract new-amount = amount
```

- Field will have attributes as defined, and value from input record, so the output record will contain the 4-byte integer value of the 8-byte display field in the input record.

Deleting selected records from the input dataset

- Open the database in mode-1, -3, or -4
- Access the dataset using GET or CHAIN
- Select records to be deleted with IF command
- Delete the selected records using DELETE
- Optional step: copy the deleted records somewhere else (e.g., OUTPUT file, LIST file, PUT to another dataset)

```
>get d-sales
>item purch-date,date,yymmdd
>if purch-date < $date(*-
1/*/*)
>delete
>output oldsales.data,append
>xeq
```

Using two passes guarantees safety

```
>get d-sales
>item purch-date,date,yymmdd
>if purch-date < $date(*-1/*/*)
>output oldsales.data,append
>xeq

>get d-sales
>if purch-date < $date(*-1/*/*)
>delete
>output $null
>xeq
```

Update selected records with new values

- Open the database in mode-1, -2, -3, or -4
- Access the dataset using GET or CHAIN
- Select records to be updated using IF
- Enable updating using UPDATE command; use CIUPDATE parameter to update critical fields
- Specify fields and new values using EXTRACT commands

```
>get d-sales
>item purch-date,date,yymmdd
>if purch-date < $date(*-1/*/*)
>update
>extract purch-status = “OLD”
>xeq
```

Assigning Calculated Values

```
>get d-sales
>update
>extract sales-total = &
        (product-price * sales-qty) + sales-tax
>xeq
Update all records from the D-SALES dataset [no]: yes
Warning:  Using DBGET for the input records
IN=8, OUT=8. CPU-Sec=1. Wall-Sec=1.
```

Set Lock to control concurrent dataset access

- SET LOCK 1
  - Lock the dataset and unlock it again around every DELETE, PUT, and UPDATE
  - Least contention with other processes, but slowest option for Suprtool
- SET LOCK 0
  - Lock the dataset at the beginning of the task and unlock it only at the end
  - Best performance for Suprtool, but locks out other processes for duration of Suprtool run
- SET LOCK *n*
  - Lock dataset on *n* DELETE, PUT, or UPDATE transactions, then unlock
  - Compromise between SET LOCK 0 and SET LOCK 1

Summary

- Display datasets
- Field names and formats
- Data chains
- List datasets
- Reports (e.g., standard, customized)
- Third-party indexing
- Adding, deleting, and modifying records
- Changing data formats
- Locking options

Inside Module 3

Working with Eloquence

Accessing data files

- These Suprtool commands access Eloquence data files:

  BASE

  GET

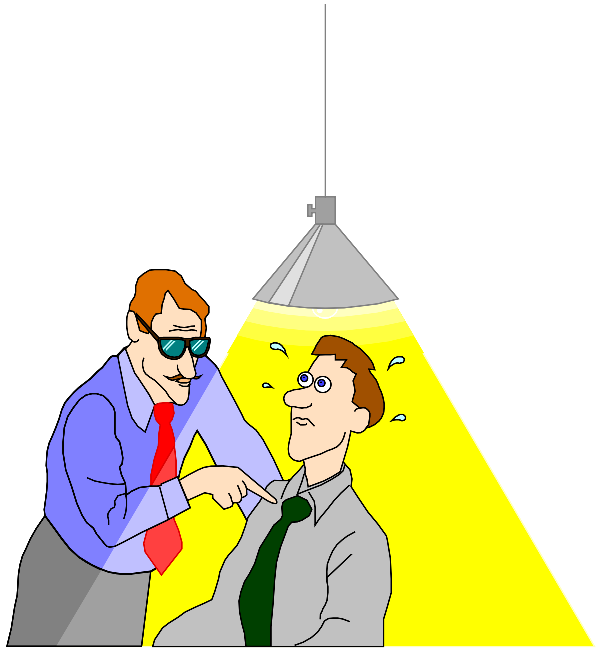
  CHAIN

  FORM

  PUT

  DELETE

  UPDATE



Opening and closing a database

- You can use the BASE command to open a database

```
>base store,5,READER
```

- The BASE command without parameters closes a database
- A database remains open until a BASE, RESET BASE or RESET ALL command is executed
- Alternate Base and Put command syntax special to Eloquence

Eloquence and Base Command

- Base Command Syntax
  - base [servername][:server/]database,mode,password
  - base myserver:eloqdb/sample,5,reader
  - base :eloqdb/sample,5,reader
  - base :eloqdb/sample
  - base sample

Put Command

- Put Command allows the same syntax
    - put dataset,[servername][:server/][database]
    - put dataset,myserver:eloqdb/sample
    - Put dataset

Summary

- Base Command Eloquence syntax
- Put Command allows the same syntax

Inside Module 4

Selecting Records with Suprtool

Selecting records

- You can use the IF command to choose records by selecting ranges of numbers, dates, or multiple criteria

```
>if sales-qty >= 100 and sales-qty < 5000
>if cust-status = 10,20,30,35
```

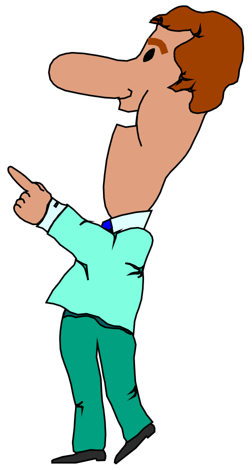
- Only *one* IF command is permitted per task

- Suprtool uses short-circuit evaluation. e.g.

```
>if age > 70 and sex = “M”
```

should be faster than:

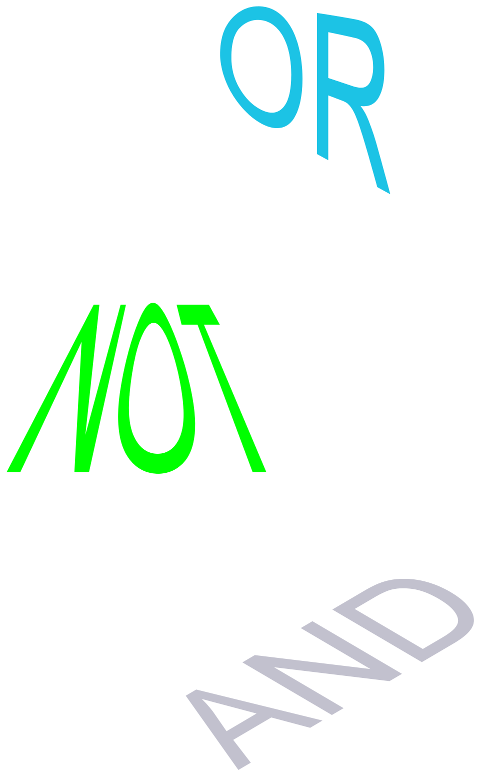
```
>if sex = “M” and age > 70
```



More options to specify selection criteria

You can also use these words and signs to select records:

- AND, OR and NOT operators
- parentheses:) or (
- relational operators: =   <   >   >=   <=   <>
- pattern matching: == and ><



Comparing fields

- You can compare one field to another

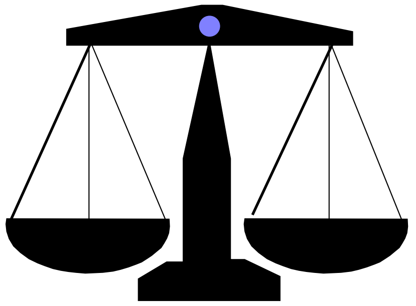
```
>if deliv-date = purch-date
```

- You can compare a numeric field to a calculation

```
>if sales-total <> product-price * sales-qty
```

- You can compare a field to a constant

```
>if cust-status = "OK","DEAC"
```



Arithmetic If expressions

- Select records based on arithmetic expressions

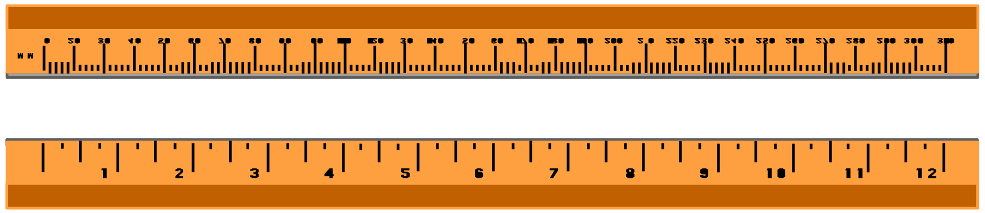
```
>if unit-cost * sales-qty > 10000

>if sales-total < sales-qty * product-price + sales-tax
```

- Use parentheses to keep things clear

Field types and sizes in comparisons

- Byte and character fields can be different sizes, but...
    - comparison is for length of shorter field
    - comparison ignores last bytes of longer field



Selecting records by pattern-matching

Pattern-matching

- Includes or excludes values in specified fields using these operators

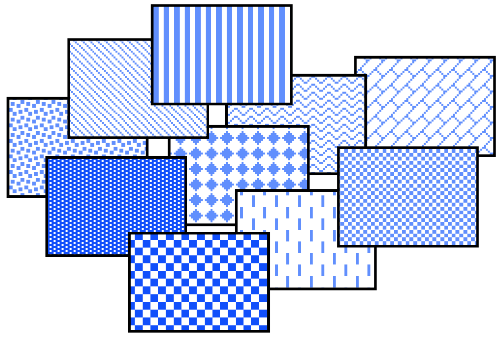
  == selects records that match pattern

  >< selects records that do not match pattern

- Can be used only on character fields

- Can specify multiple selection criteria

- Can use special characters to define selection criteria



Special characters in pattern-matching

- Use these special characters to match patterns:

@	represents any *string* of characters
?	represents one *alphanumeric* character
#	represents one *numeric* character
~	represents zero or more *blanks*
&	indicates the next character is *literal*

Exercise 1
Solve a crossword puzzle

- Use Suprtool to solve this crossword puzzle:
  - an 8 letter word
  - meaning “most befuddled or dazed”
  - second letter is an “o”
  - fourth letter is a “z”
- HINT: Suprtool has a spelling checker. Each word in its dictionary is stored as one record.

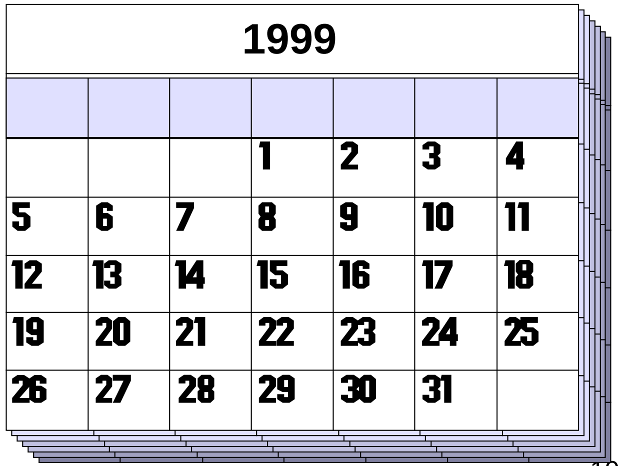
Identifying a field as a date

- First use the ITEM command to identify a field as a date:

```
>item transaction-date,date,mmddyy
>item date-of-birth,date,phdate
>item disbursement-date,date,ccyymmdd
```

- Then use the IF command to select records:

```
>if transaction-date = $today and &
 date-of-birth < $date(1950/01/01) &
 and disbursement-date >= &
 $date(*+5/*/*)
```



$DATE - Supported Date Formats

1.	YYMMDD	MMDDYY	DDMMYY
	YYYYMMDD / CCYYMMDD	MMDDYYYY	DDMMYYYY
2.	YYMM		
	YYYYMM / CCYYMM	MMYYYY	
3.	CCYY		
4.	YYYMMDD		
5.	AAMMDD	MMDDAA	DDMMAA
	AAMM		
6.	YYDDD		
	CCYYDDD		
7.	ASK, Calendar, HPCalendar, Oracle, PHDate, SRNChronos		

Dates as selection criteria

- You can select records by specifying date criteria

```
>item purch-date,date,phdate
>if purch-date = $date(98/11/30) {Nov. 30, 1998}
```

- You can also select a range of dates (e.g., all of December 1998)

```
>if purch-date > $date(98/11/30) and &
  purch-date < $date(99/01/01)
>if purch-date >= $date(98/12/01) and &
  purch-date <= $date(98/12/31)
```

Choosing records by relative date

- The $TODAY function optionally accepts an argument that indicates the number of days before or after the current day

```
 >item expiry,date,yymmdd
 >if expiry = $today        {today}
 >if expiry = $today(-1)    {yesterday}
 >if expiry > $today(+14)   {more than 2 weeks away}
```

- Suprtool converts the $DATE function into a constant

```
>item date-field,date,mmddyy
>if date-field = $date(*/*-6/*)  {six months ago}
>if date-field = 091898     {if today is Mar. 18, 1999 (constant)}
```

Dates must collate correctly for > and <

- $DATE gets converted to a constant
- For ddmmyy or mmddyy dates, the constant is in that format
- ddmmyy and mmddyy dates don't sort properly
- Suprtool rejects greater than or less than comparisons for them
- Error: Invalid date format for the comparison
- Use $STDDATE for non-collating dates

Use $STDDATE for non-collating dates

- Turn a non-collating date into CCYYMMDD format:

```
>item purch-date,date,mmddyy
>if $stddate(purch-date) < $today
```

- Compare dates in two different formats by converting them both to CCYYMMDD format:

```
>item purch-date,date,mmddyy
>item deliv-date,date,ddmmyyyy
>if $stddate(purch-date) <= $stddate(deliv-date)
```

- Dates must be valid for $stddate to work:

```
>item purch-date,date,mmddyy
>if not invalid(purch-date) and &
 $stddate(purch-date) < $today
```

Date Arithmetic

- You can calculate the difference between 2 dates using the **$days** function

- **$days** converts a date to the **juliandays** date format. I.e. the number of days since a base date (4713 BC)

```
item purch-date,date,YYYYMMDD
item deliv-date,date,YYYYMMDD
if $days(deliv-date) - $days(purch-date) > 5
```

- Invalid dates return value 0 (zero)

Converting days back to dates

- **Juliandays** date format represents days offset from 4713 BC

- Combine **juliandays** with **$stddate** to convert result of **$days** calculations:

```
>….
>extract latest-delivery = ($days(date-ord) + 7)
>xeq
>…
>item latest-delivery,date,juliandays
>item deliv-date,date,YYYYMMDD
>extract deliv-date = $stddate(latest-delivery)
```

Verify that dates are valid

- Use $INVALID to select records with invalid dates

```
>item purch-date,date,yymmdd
>if $invalid(purch-date)
>list standard title “Records with bad dates”
```

- Or use it to deselect invalid dates

```
>if not $invalid(purch-date) and &
 purch-date > $date(*/*-6/*)
```

Year 2000 dates

- Some selections generate “invalid” date constants, if the date field cannot hold century information and the constant would be in the next century

```
>item purch-date,date,yymmdd
>if purch-date > $date(*+5/*/*)
Error: Cannot use a date beyond 1999 for this format
```

- You can override this error condition

```
>set date ifyy2000error off
```

- Or you can use $STDDATE to assume a century

```
>set date cutoff 50
>if $stddate(purch-date) > $date(*+5/*/*)
```

$truncate, Mod mod and $abs functions

- **$truncate** returns “whole number”, I.e. drops decimals
  ```
  $truncate(127.2 / 12) = 10
  ```

- **Mod** returns the remainder
  ```
   7 mod 5 = 2
  ```

- **$abs** returns the absolute value (no sign)
  ```
   $abs(-121) = 121
  ```

Selecting on parts of a number

- You can select any part of a numeric field with the If command
- Use a divide operation to select on the high-order digits

```
>if $truncate(ord-date-yymmdd / 100) = 9812
```

- Use MOD to select on the low-order digits

```
>if ord-date-yymmdd mod 100 <= 15
```

- Use divide and MOD together to select on middle digits

```
>if ($truncate(ord-date-yymmdd / 100) mod 100) <= 02
```

Calculating day of week

- Juliandays measures offset from a Monday

- Combine $days with mod to calculate day-of-week

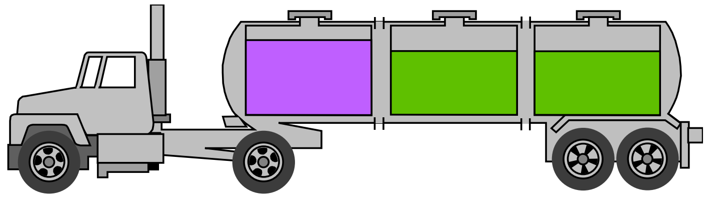
```
>ite ord=date,date,YYYYMMDD
>ext day = ($days(dt) mod 7)

0 = Monday
1 = Tuesday
2 = Wednesday
      ……
6 = Sunday
```

Comparing sub-fields

- You can select any part of a character field with the IF command
- If we define a street-address field as 2X25, any part of this field can be selected

```
>if street-address(2) = "Canada"
>if street-address(1,7,2) = "10"
>if street-address(1,13) = "Marine Drive"
```



Testing byte type fields

- You can test if a byte type field contains alpha, numeric, alphanumeric or special characters

```
>if cust-account = numeric

>if street-address <> alphanumeric
```

- You can also check for an ASCII character by specifying its numeric value or control letter

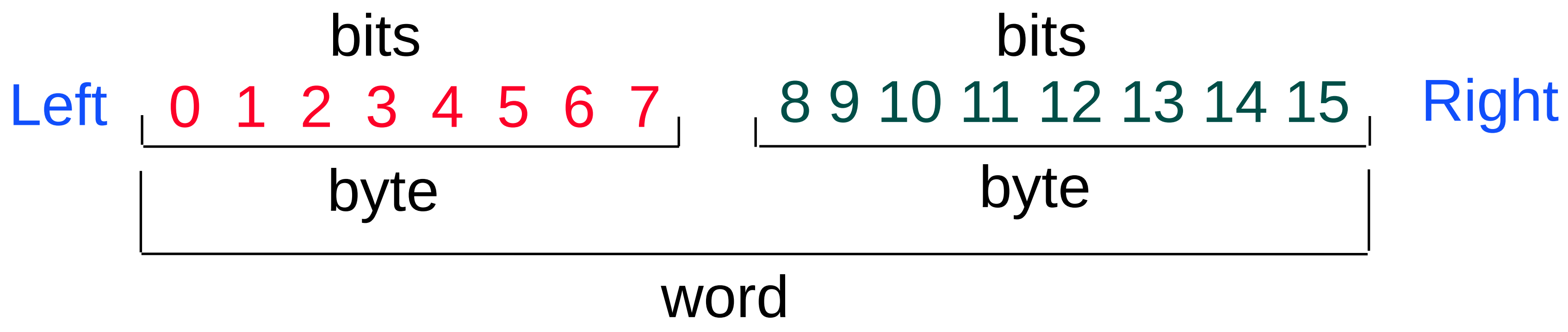
```
>define any-char,1,1,byte
>if any-char = ^13                    {if byte is a Return}
>if any-char = ^G                     {if byte is a Bell}
```

Checking bits within a field

- The IF command can select records based on bit values in a field

```
>if cust-status.(3:1) = 1
>if cust-status.(3:2) = 0
```

- Bit checking only works for 16-bit words

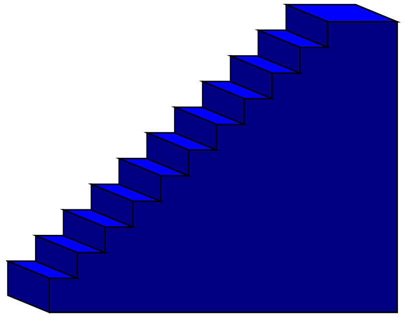


- Field must be *Integer* or *Logical*

Extending the If command

- You can extend the length of an IF command beyond the 256 character limit by using the $READ function

```
>get m-customer
>if $read
-name-last == "@Kirk@" and
-state-code = "BC"
-and
-cust-account >
-12
-//
```



- $READ prompts for the next line of the IF expression until it encounters a Return or a double slash (//)

Creating tables as selection criteria

- The TABLE command creates a set of values that can be used as selection criteria:

TABLE *tablename, itemname, table-keyword, table-values*

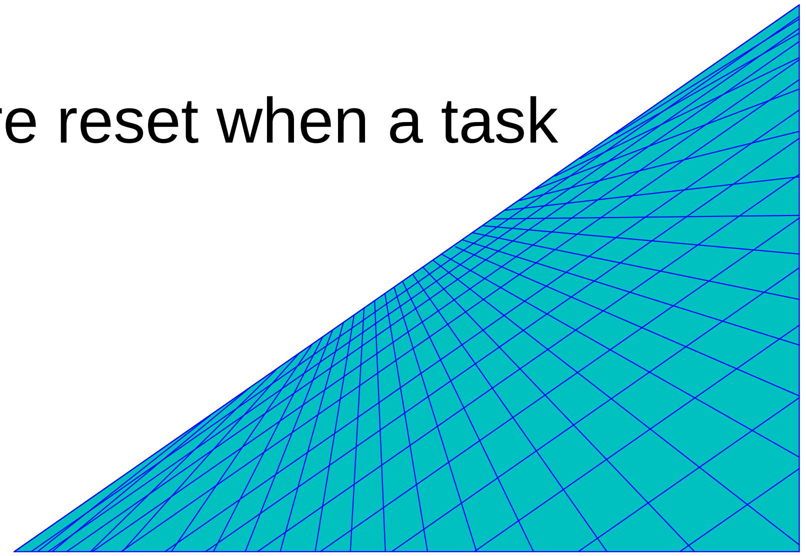
```
>table select,transcode,item,"BUY","SELL"

>table cust-table,cust-num,file,custfile
```

- The source of input can be an item value or a file
- The TABLE command sorts values as they are loaded into a table

Table characteristics

- Only *one key* can be put into a table
- Suprtool can handle up to *ten tables*
- Each table can have up to *two gigabytes* of data on MPE
- 500 Mbs in total on HP-UX
- Tables are *temporary* structures that are reset when a task has been completed
- You can *hold* a table so it is not reset
- Table values are *sorted*

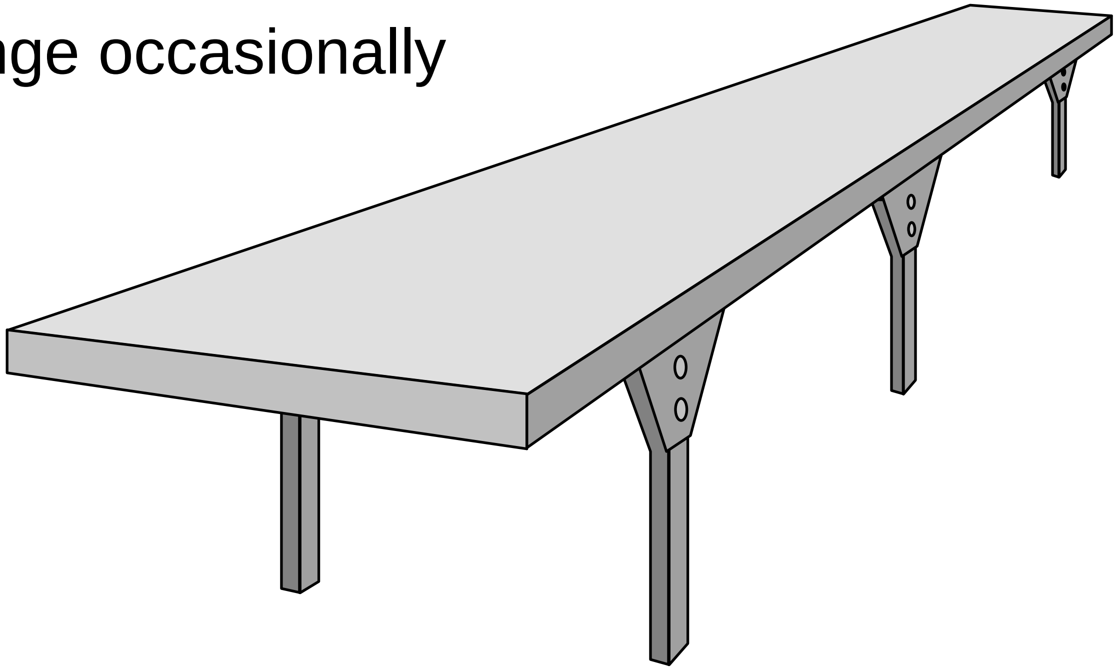


When would I use a table?

- Instead of listing all the values

```
>if field = value1,value2,value3
```

- When there are too many values to fit in an IF command
- When the selection values change occasionally
- When the selection is based on the results of a prior task



Loading a table with values from a file

- If the file containing the values is not sorted, specify FILE as the keyword

```
>table states,st-code,file,western.data
>if qty-ship < qty-order and $lookup(states,st-code)
```

- If the file is sorted, specify SORTED as the keyword

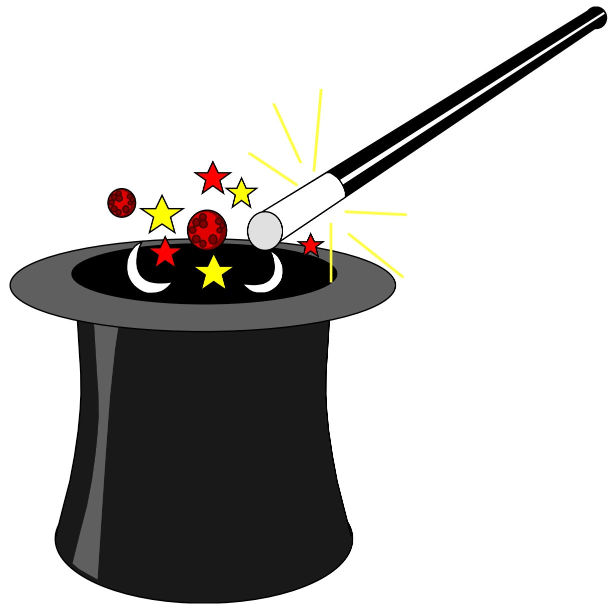
```
>table states,st-code,sorted,western.data
>if qty-ship < qty-order and $lookup(states,st-code)
```

- The field selected from the input file must have exactly the same format as the table

How does the Table command find a field?

- If the input file is self-describing, Suprtool finds the location of the field via the user label

- If the file is not self-describing, or the named field is not found in the file label, Suprtool loads the requested data from the start of each record



Inserting items into a table

- You can also use the TABLE command to insert hardcoded values
- Specify ITEM as the table keyword

```
>table states,st-code,item,"WA","OR","CA"
>table states,st-code,item,"WI","ID","NE"
>table states,st-code,item,"NM","AK","HI"
>if cust-status = "OK" and $lookup(states,st-code)
```

Selecting input records that match a value in a table

- Use the $LOOKUP function with the IF command to select records that match a value in a table

```
>if $lookup(cust-table,cust-acct)
```

- If the $LOOKUP function finds a match, the expression is true
- If there are multiple conditions in the IF expression, the expression is evaluated faster when $LOOKUP is the last condition

```
>if status = "10" and $lookup(cust-table,cust-acct)
```

- Use NOT to select records which don’t match table values

Lookup and Data

```
>get    ord-details
>table  cust-table, cust-no, file, custlist,data(state-code)
>if     $lookup(cust-table, cust-no, state-code) = state-code
>output orders
>xeq
```

Saving and deleting tables

- The HOLD option tells Suprtool to save a table after a task has been completed

```
>table states,st-code,file,western.data
>table parts,part-no,file,partin,hold
```

- The RESET TABLE command clears all the tables. You cannot reset individual tables.

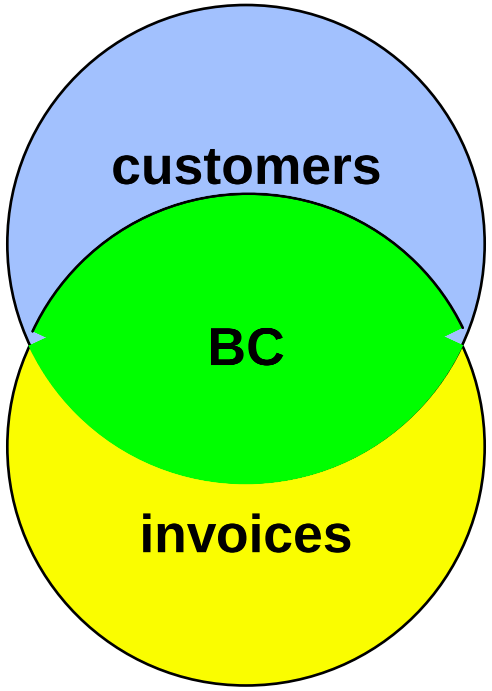
```
>reset table
```

Can we find all the invoices for BC customers and sort them by customer ID?

- The invoice records are in the sales detail dataset, but state-code is in the customer master record

```
>get m-customer
>if state-code = "BC"
>extract cust-account
>output bccust
>xeq

>table bc,cust-account,file,bccust
>get d-sales
>if $lookup(bc,cust-account)
>sort cust-account
>list standard
>xeq
```



Selecting records using the Chain command

- Alternately, you can use the CHAIN command to find the required invoices after you have created an output file of British Columbia customers (Bccust)

```
>table brit,cust-account,file,bccust
>chain d-sales,cust-account=brit
>list standard
>xeq
```

- The CHAIN command performs keyed retrievals for the values in the table.

- No SORT command is necessary because the CHAIN command retrieves the records in the same order as they are found in the table

String Functions and Features

- $TRIM,$RTRIM,$LTRIM
- $UPPER,$LOWER
- + Operator andTarget field

Summary

- IF command
- Field comparison
- IF expressions (Boolean operators, parentheses)
- Pattern-matching
- Date fields
- Sub-field comparisons
- $READ function
- Tables
- Selecting from one file based on criteria in another file

Inside Module 5

Working with Files

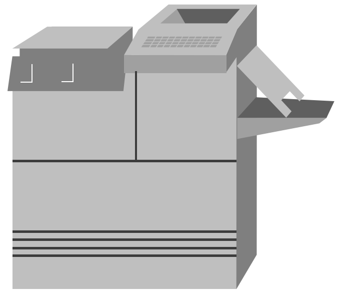
Copying files

- Copying an MPE file

```
>input file1
>output file2
>xeq
```

- Copying an entire dataset to an MPE file

```
>base store
>get m-customer
>output custdump
>exit
```



MPE files vs HP-UX files

- File system differences
- Input command requires more information on HP-UX
- Reclen
- Linefeeds

Working with ordinary disc files

- A source of input files can be ordinary disc files, such as MPE, KSAM, tape files or POSIX files
- You can select, extract, and sort these files
- Listing the Custdump file

```
>input custdump
>list char
>xeq
```

POSIX filespace vs MPE filespace

- MPE filenames have three parts:
  - file.group.account
  - file.group *account is assumed*
  - file *group and account are assumed*
- POSIX filenames can have any number of parts:
  - ./file *assumed to be in the current directory*
  - ../file *in the next level 'up'*
  - ./Letters/PersonalStuff/Mom-1999-04-15
  - /ACCOUNT/GROUP/FILE
- Suprtool can use POSIX files anywhere it can use MPE files
- HP-UX files are similar to MPE's POSIX files

Define the record structure

- Use the DEFINE command to describe the layout of a flat file

```
>input custdump
>define account,17,8
>define lastname,37,16
>define credit,13,4,int;item credit,decimal,2
>extract account,lastname,credit
>sort account
>if credit > 2000.00
>list standard
>xeq
```

```
May 06, 1996 22:28     File: CUSTDUMP       Page 1
ACCOUNT  LASTNAME             CREDIT

00010003 Melander            2500.00
00010005 Coyle               2400.00
```

Let Suprtool maintain field names

- Use the INPUT command to tell Suprtool that a file has the same structure as a dataset

```
>input custdump = m-customer
>item credit-rating,decimal,2
>extract cust-account,name-last,credit-rating
>sort cust-account
>if credit-rating > 2000.00
>list standard
>xeq

May 06, 1996 22:38         File: CUSTDUMP        Page 1
CUST-ACCO NAME-LAST            CREDIT-RATING

   10003  Melander                     2500.00
   10005  Coyle                        2400.00
```

To create, or not to create -- that is the option

- Default is to create a new, permanent file

```
>output custdump
```

- TEMP creates a temporary file

```
>output foo,temp
```

- APPEND adds data to an existing file

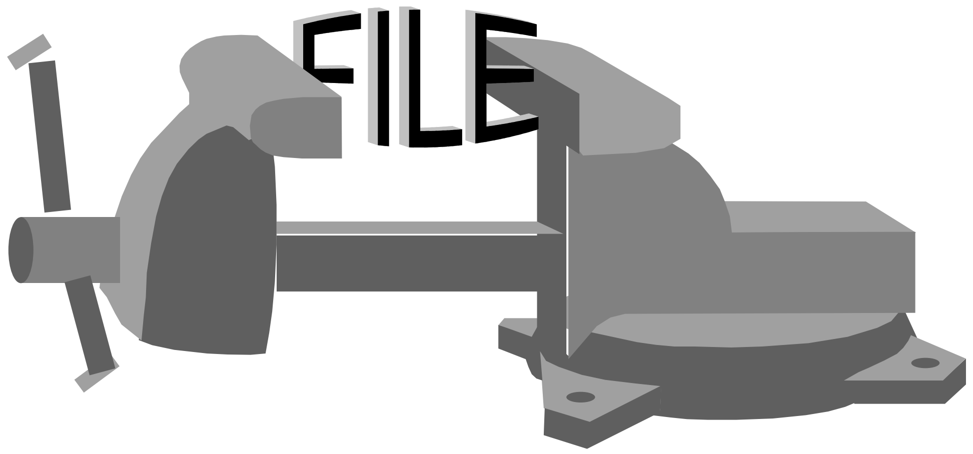
```
>output blabla,append
```

- ERASE overwrites an existing file

```
>output subfile,erase
```

To squeeze, or not to squeeze, that is the option

- Sometimes output file capacity (limit) is set higher than the number of records (EOF)
- Sometimes the limit is squeezed to the EOF to save disc space
- You control it with SET SQUEEZE ON or OFF
- To reserve space for appending later, use SET SQUEEZE OFF



To squeeze, or not to squeeze, what is the default?

- If you specify Set Squeeze On or Off, Suprtool will do what you say
- If you don’t specify, Suprtool makes up its own mind
- The Output file will be squeezed except in these cases:
  - input is a file, not a dataset
  - output option is Append or Erase
  - output option is Ask or Num,Query

Writing records

- The OUTPUT command determines where your output records go and in what format

```
>output customer,num,data
```

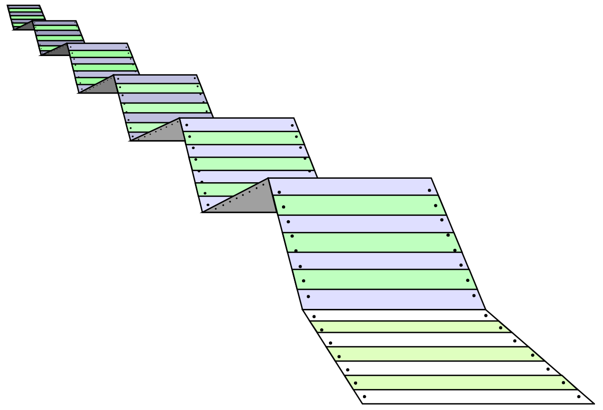
- Select one of these output formats:

  Data (default) - records are identical to input format
  Key - records contain only the sort keys
  Num - records contain 32-bit input record number

More common record formats

- Additional formats of the OUTPUT command:

Num,Key	
Num,Data	
Query	ancient self-describing
Link	improved self-describing
Num,Query	
Ask	ASK report writer
ASCII	human-readable
Display	computer-readable
PRN	import to PC program



Numrecs controls size of output file

- Limit the number of records selected
- Limit the size of the sort scratch files
- Limit the size of the output file if input is a dataset
- Specify the number of records in a tape file
- Use percentage >100 with SET SQUEEZE OFF to create output file bigger than input file. This provides space for appending records.

```
>numrecs 100
>numrecs 100000
>numrecs 10%
>numrecs 200%
```

Listing records

- Listing refers to displaying the records in either a dump format or as simple reports
- Use the LIST command to produce formatted listings of selected records

```
>list octal,char
>list decimal,record
>list standard
>list hex,char,labels
```

List format of nonself-describing files

```
>in catalog.pub.sys(12/12)
>list
>exit

>IN CATALOG.PUB.SYS (12) >OUT $NULL (12)
00000: 030460 020127 071157 067147 020166 067554 10 Wrong vol
00006: 072555 062440 067556 020114 042145 073043 ume on LDev
00014: 056056 020040 040556 067564 064145 071040 .  Another
00022: 060566 060551 066141 061154 062440 024131 available (Y
00030: 027516 024477 020040 020040 020040 020040  /N)?
00036: SAME TO: 000043
00044: 030060 030061 031460 030060               00013000
```

Some List options for reports

- ONEPERLINE
- NONAME
- NOSKIP
- STANDARD format
- DUPLEX printing
- HEADINGS
- NOREC

Listing one field per line

```
>get m-customer
>list oneperline
>xeq
```

```
>GET M-CUSTOMER (1) >OUT $NULL (0)
NAME-FIRST   = Terry
NAME-LAST    = Coyle
STATE-CODE   = AL
CUST-STATUS  = 30
```

Preparing program input by combining List options

- Combine LIST options to format input to other programs

```
>get m-customer
>extract name-last, name-first, city, state-code
>list norec, noskip, noname, oneperline
>file suprlist=myinput,new;save;dev=disc;
                             rec=-80,,f,ascii;nocctl
>xeq
```

- Run the program with the file as input

```
:run dataload.prog;stdin=myinput
```

or....

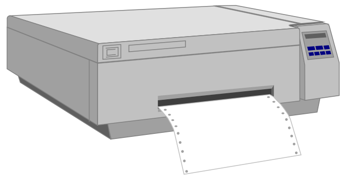
```
:run dataload.prog < myinput
```

Printing reports

- The LIST command writes to an output file called Suprlist, which defaults to $stdlist
- Override the default using a file command

```
    :file suprlist;dev=laser155
```

- Listing to a LaserJet
- SET PCL command indicates page orientation and font type



Printing mailing labels

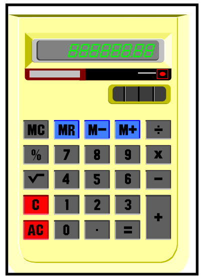
- Use the EXTRACT command with LIST ONEPERLINE to produce mailing labels

```
>get m-customer
>extract " "            {blank line}
>extract " "            {blank line}
>extract customer-name
>extract street-address(1)
>extract street-address(2)
>extract street-address(3)
>extract " "            {blank line}
>list oneperline,noname,noskip,norec
>xeq
```

Calculating totals in numeric fields

- The TOTAL command provides an easy way to sum the contents of one or more numeric fields in selected records

```
>if state-code = "BC"
>total sales-total
```



- By default, the result is printed to $stdlist or can be redirected to another device

- If you are using the Suprtool2 interface from a programming language, the total amount is returned to the calling program in the workspace

Sorting records

- Suprtool can sort in several ways
  - On any field
  - On any part of an input record, not just previously defined fields
  - According to multiple sort keys (e.g., primary, secondary)
  - Ascending or descending order

- MPE files require a DEFINE command to define the field or use the KEY command

Working with duplicate records

- DUPLICATE [NONE | ONLY] [RECORD | KEYS [*n*]]

```
>duplicate none record
>duplicate none keys 1
>duplicate only record
>duplicate only keys
```

- DUPLICATE NONE KEYS [*n*] [COUNT] [TOTAL *field* [*field*...]]

```
>duplicate none keys count
>duplicate none keys total sales-qty sales-value
>duplicate none keys count total sales-qty sales-value
```

Discarding duplicates from the output file

- Remove duplicates to get a list of unique values or records
- Based on the whole record or the sort key(s)

Input file - 6 records

```
10003   112.07   19931015   505
10003   166.00   19931015   505
10003   219.10   19931015   505
10016   159.42   19931021   505
10020   224.15   19931001   505
10020   167.13   19931028   505
```

```
>sort cust-account
>dup none keys
```

Output file - 3 records

```
10003   112.07   19931015   505
10016   159.42   19931021   505
10020   224.15   19931001   505
```

Saving only the duplicates

- Remove “originals” to get a list of duplicate values or records
- Exact opposite of DUPLICATE NONE

Input file - same 6 records

```
10003   112.07   19931015   505
10003   166.00   19931015   505
10003   219.10   19931015   505
10016   159.42   19931021   505
10020   224.15   19931001   505
10020   167.13   19931028   505
```

```
>sort cust-account
>dup only keys
```

Output file - the other 3 records

```
10003   166.00   19931015   505
10003   219.10   19931015   505
10020   167.13   19931028   505
```

Counting records

- DUPLICATE COUNT can tell you how many records have the same key

Input file - 6 records

```
10003  112.07  19931015

10003  166.00  19931015

10003  219.10  19931015

10016  159.42  19931021

10020  224.15  19931001

10020  167.13  19931028
```

```
>get d-sales
>sort cust-account
>duplicate none keys count
```

Output file - 3 records

```
10003  112.07  19931015  3

10016  159.42  19931021  1

10020  224.15  19931001  2
```

Totaling records

- DUPLICATE TOTAL calculates a field total for all records with the same key

Input file - 6 records

```
10003   112.07   19931015

10003   166.00   19931015

10003   219.10   19931015

10016   159.42   19931021

10020   224.15   19931001

10020   167.13   19931028
```

```
>get d-sales
>sort cust-account
>duplicate none keys total sales-
                              total
```

Output file - 3 records

```
10003   112.07   19931015   497.17

10016   159.42   19931021   159.42

10020   224.15   19931001   391.28
```

Exercises
Duplicates, Duplicates, Duplicates, Duplicates

- Exercise 1

  Create a list of all the states/provinces in which we have customers

- Exercise 2

  List all the dates on which we made more than one sale

- Bonus Exercise 3

  List all the sales made on the dates in Exercise 2

  HINT: Requires two passes, and the TABLE command

How to check Suprtool results

- Use the :SHOWJCW command to check the Job Control Word (JCW) after a task has been completed
- On MPE V and MPE/iX, the SUPRTOOLOUTCOUNT JCW contains the number of records written to the output file (up to 65,535 maximum)
- On MPE/iX, the SUPRTOOLFULLCOUNT variable also contains the output count (no limit)
- On HP-UX, -oc option puts count into .stoutcount

Summary

- Copy a dataset or a file
- Define new fields
- Select a set of records
- Produce listings
- Specify record formats
- Sorting records
- Checking for duplicates

Inside Module 6

Working with Suprlink

Suprlink expands Suprtool capabilities

Suprlink

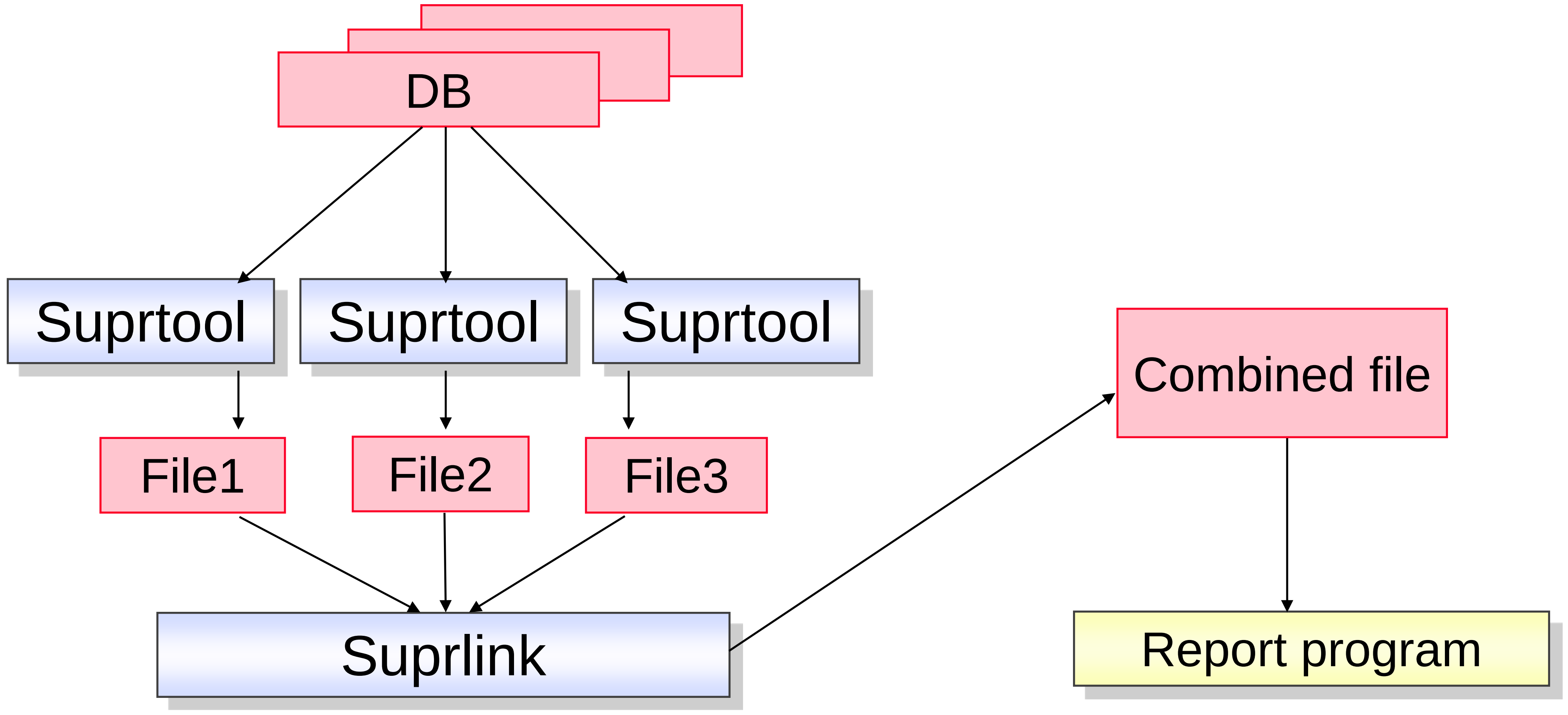
- Adds multi-file linking to Suprtool's remarkable speed
- Works on IMAGE, KSAM, and MPE files
- Merges up to 8 files into one
- Creates one sorted file as input to your report programs

“

We love Suprtool's speed, but couldn't we have multiple dataset extracts too?

”

Suprlink ties your data together



Three ways to access Suprlink

- Use the RUN command to use Suprlink directly

```
:run suprlink.pub.robelle
+input file1
+link file2
+output file3
+exit
```

- Use the Suprtool LINK command to start Suprlink

```
:run suprtool.pub.robelle
>link
+input file1
+link file2
+output file3
+exit
>
```

Three ways to access Suprlink continued

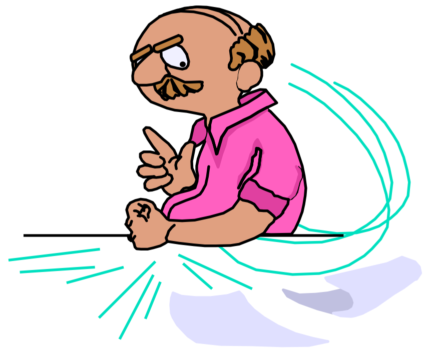
- Use Suprtool’s LINK command to pass commands to Suprlink

```
:run suprtool.pub.robelle
>link input file1
>link link file2
>link output file3
>link exit
```

- On HP-UX run Suprlink directly.
  - /opt/robelle/bin/suprlink

I need all invoices over $100 for British Columbia customers, now!

- Step 1: Identify the required data, and their sources
- Step 2: Use Suprtool to select and sort records from each dataset or file, extracting the required fields
- Step 3: Link the extracted files
- Step 4: Produce the report from the linked file



What should the report look like?

```
May 12, 1996   9:18             BC Sales over $100        Page 1

Account#   Name                Purch Date     Amount    Product#


   10003   Melander   John       19931015     112.07    50511501
                                 19931015     166.00    50512501
                                 19931015     219.10    50513001
   10020   Nisbet     Walley     19931001     224.15    50511501
                                 19931028     167.13    50512501
```

Step 1: Where are the records located?

- Suprtool’s FORM SETS command lists all the sets in a database opened with the BASE command, and describes their attributes
- Use the FORM *dataset* command to list field names in a dataset
- Use COBOL Copylib or Cognos Qschema listings to get the layouts of non-IMAGE files

What datasets are in the Store database?

```
:run suprtool.pub.robelle
>base store.demo
>form sets
```

```
Database: STORE.DEMO.ROBELLE
                Set         Item                 Entry     Load     Entry
Sets:           Num  Type   Count    Capacity    Count     Factor   Length  B/F
   M-CUSTOMER   1    M      9        211         20        9  %     55      7
   M-PRODUCT    2    M      3        307         13        4  %     24      12
   M-SUPPLIER   3    M      6        211         3         1  %     49      8
   D-INVENTORY  4    D      6        462         13        3  %     15      22
   D-SALES      5    D      8        602         8         1  %     19      14
```

What fields are in the m-customer dataset?

```
>form m-customer
Database: STORE.DEMO.ROBELLE
   M-CUSTOMER          Master     Set# 1
     Entry:                         Offset
       CITY                      X12      1
       CREDIT-RATING             J2      13
       CUST-ACCOUNT              Z8      17   <<Search Field>>
       CUST-STATUS               X2      25
       NAME-FIRST                X10     27
       NAME-LAST                 X16     37
       STATE-CODE                X2      53
       STREET-ADDRESS           2X25     55
       POSTAL-CODE               X6     105
   Capacity: 211 (7)  Entries: 20  Bytes: 110
```

What fields are in the d-sales dataset?

```
>form d-sales

Database: STORE.DEMO.ROBELLE
  D-SALES                 Detail     Set# 5
     Entry:                             Offset
        CUST-ACCOUNT           Z8         1   (!M-CUSTOMER)
        DELIV-DATE             J2         9
        PRODUCT-NO             Z8        13   (M-PRODUCT)
        PRODUCT-PRICE          J2        21
        PURCH-DATE             J2        25
        SALES-QTY              J1        29
        SALES-TAX              J2        31
        SALES-TOTAL            J2        35
  Capacity: 602 (14)  Entries: 8  Bytes: 38
```

Step 2: Extracting and sorting records

- First, we need to read all the customer records of British Columbia customers and extract the cust-account, name-last, and name-first fields

- Next, we have to read all the records of invoices over $100 and extract the cust-account, product-no, purch-date, and sales-total fields

- The cust-account field is common to both records, so we will sort both files by this cust-account

Reading records of British Columbia customers

- Use Suprtool to select and sort British Columbia customers

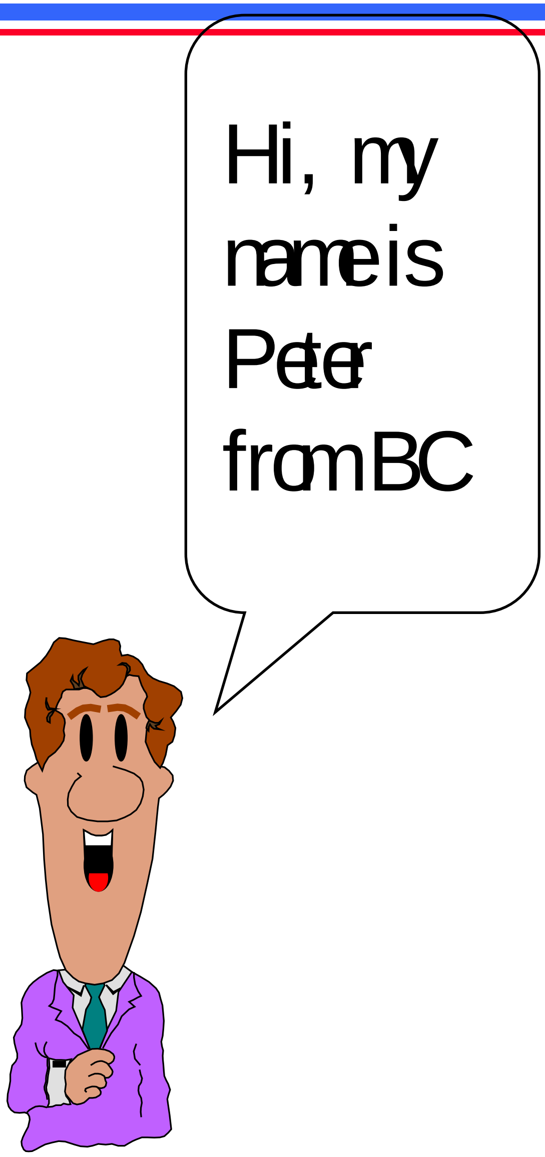
```
>get m-customer
>if state-code = "BC"
>sort cust-account
>extract cust-account,name-last,name-first
>output custfile,temp,link
>xeq
```

List of British Columbia customers

```
>input custfile;list standard;xeq
CUST-ACCO        NAME-LAST     NAME-FIRST
     10001       Hamilton      Darlene
     10002       Lackner       Gordon
     10003       Melander      John
     10008       Sarafin       Thomas
     ...
     10020       Nisbet        Walley
```

What is a self-describing file?

- It is a standard MPE disc file
- It has user labels that contain a mini-dictionary describing record structures
- Use the FORM command to see the structure



Suprlink requires self-describing (SD) files

- Suprlink uses self-describing files as input and creates SD files as output

- The LINK option of the Suprtool OUTPUT command specifies a self-describing file

```
>output custfile,temp,link
```

- In our example, Custfile and Tranfile are self-describing files that Suprlink can use as input

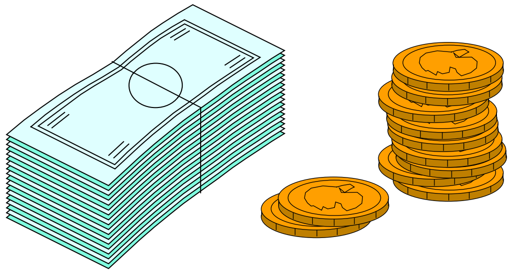
Reading records of invoices over $100

- Use Suprtool again to select and sort records with invoices greater than $100

```
>get d-sales
>item sales-total,decimal,2
>if sales-total > 100.00
>sort cust-account
>sort purch-date
>extract cust-account,sales-total,purch-date,product-no
>output tranfile,temp,link
>xeq
```

List of invoices over $100

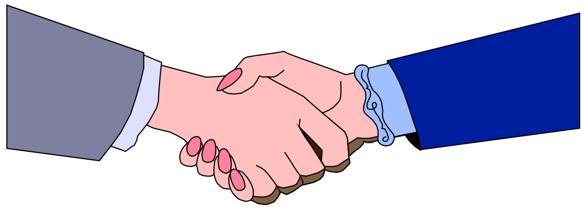
```
>input tranfile;list standard;xeq
CUST-ACCO  SALES-TOTAL   PURCH-DATE PRODUCT-NO
  10003    112.07        19931015   50511501
  10003    166.00        19931015   50512501
  10003    219.10        19931015   50513001
  10016    159.42        19931021   50532001
  10020    224.15        19931001   50511501
  ...
```



Step 3: Linking customer and invoice records

- Use Suprlink to merge the extracted records

```
:run suprlink.pub.robelle
+input tranfile
+link custfile
+output reptfile,temp
+exit
```



What is the structure of the merged file?

```
>form reptfile
File: REPTFILE.DATA.SALES     (SD Version B.00.00)
  Entry:                       Offset
    CUST-ACCOUNT               Z8      1  <<Sort# 1 >>
    SALES-TOTAL                I2      9              << .2  >>
    PURCH-DATE                 I2     13  <<Sort# 2 >>
    PRODUCT-NO                 Z8     17
    NAME-LAST                  X16    25
    NAME-FIRST                 X10    41
  Limit: 6  EOF: 5  Entry Length: 50  Blocking: 81
```

How does the merged file look?

```
>input reptfile;list standard;xeq

CUST-ACCO SALES-TOTAL PURCH-DATE PRODUCT-N  NAME-LAST  NAME-FIRST
  10003   112.07      19931015   50511501  Melander   John
  10003   166.00      19931015   50512501  Melander   John
  10003   219.10      19931015   50513001  Melander   John
  10020   224.15      19931001   50511501  Nisbet     Walley
  10020   167.13      19931028   50512501  Nisbet     Walley
  ...
```

How does the link work?

Input file - 6 records

10003	112.07	19931015	505
10003	166.00	19931015	505
10003	219.10	19931015	505
10016	159.42	19931021	505
10020	224.15	19931001	505
10020	167.13	19931028	505

Link file - 12 records

10001	Hamilton	Darlene
10002	Lackner	Gordon
10003	Melander	John
10008	Sarafin	Thomas
10009	Oxenbury	Gordon
10010	Humphreys	Wayne
10011	Kirk	William
10012	Ferguson	Percy
10013	Andersen	Colin
10020	Nisbet	Walley

How the link works

Input file - 6 records

10003	**112.07**	**19931015**	**505**
10003	**166.00**	**19931015**	**505**
10003	**219.10**	**19931015**	**505**
10016	159.42	19931021	505
10020	224.15	19931001	505
10020	167.13	19931028	505

Link file - 12 records

10001	Hamilton	Darlene
10002	Lackner	Gordon
10003	**Melander**	**John**
10008	Sarafin	Thomas
10009	Oxenbury	Gordon
10010	Humphreys	Wayne
10011	Kirk	William
10012	Ferguson	Percy
10013	Anderson	Colin
		alley

Output file - 5 records

10003	**112.07**	**19931015**	**50511501**	**Melander**	**John**
10003	**166.00**	**19931015**	**50512501**	**Melander**	**John**
10003	**219.10**	**19931015**	**50513001**	**Melander**	**John**
10020	224.15	19931001	50511501	Nisbet	Walley
10020	167.13	19931028	50512501	Nisbet	Walley

What happens if we reverse the linking order?

```
>link input custfile
>link link tranfile
>link output reptfile,temp
>link xeq


>input reptfile;list standard;xeq

CUST-ACCO  NAME-LAST  NAME-FIRST  SALES-TOTAL  PURCH-DATE  PRODUCT-N
  10003    Melander   John        112.07       19931015    50511501
  10020    Nisbet     Walley      224.15       19931001    50511501
  ...
```

Reversing the input and link files

Input file - 12 records

10001	Hamilton	Darlene
10002	Lackner	Gordon
10003	**Melander**	**John**
10008	Sarafin	Thomas
10009	Oxenbury	Gordon
10010	Humphreys	Wayne
10011	Kirk	William
10012	Ferguson	Percy
10013	Andersen	Colin
1		

Link file - 6 records

10003	**112.07**	**19931015**	**505**
10003	166.00	19931015	505
10003	219.10	19931015	505
10016	159.42	19931021	505
10020	224.15	19931001	505
10020	167.13	19931028	505

Output file - 2 records

10003	**Melander**	**John**	**112.07**	**19931015**	**50511501**
10020	Nisbet	Walley	224.15	19931001	50511501

What if an invoice does not match a customer record?

- By default, Suprlink drops *input* records without a matching record in the link file
- Specify LINK OPTIONAL to override this default and include unmatched input records
- LINK OPTIONAL does not include *link* records without a matching record in the input file

Including unmatched records

```
>link input tranfile
>link link custfile optional
>link output reptfile,temp
>link xeq
```

Including unmatched input records

Input file - 6 records

```
10003   112.07   19931015   505
10003   166.00   19931015   505
10003   219.10   19931015   505
10016   159.42   19931021   505
10020   224.15   19931001   505
10020   167.13   19931028   505
```

Link file - 12 records

```
10001   Hamilton    Darlene
10002   Lackner     Gordon
10003   Melander    John
10008   Sarafin     Thomas
10009   Oxenbury    Gordon
10010   Humphreys   Wayne
10011   Kirk        William
10012   Ferguson    Percy
10013   Anderson    Colin
                    alley
```

Output file - 6 records

```
10003   112.07   19931015   50511501   Melander   John
10003   166.00   19931015   50512501   Melander   John
10003   219.10   19931015   50513001   Melander   John
10016   159.42   19931021   50532001
10020   224.15   19931001   50511501   Nisbet     Walley
10020   167.13   19931028   50512501   Nisbet     Walley
```

Step 4: Produce the report

- Use your favorite report writer to format the final report, adding headings, titles, and other features
- The report writer has almost no work to do
- Use Suprtool LIST command if the reporting needs are basic

Suprtool can (almost) produce the report

```
>input reptfile
>extract cust-account,name-last,name-first,purch-date,&
>>sales-total,product-no
>list standard,title "BC Sales over $100",&
>>heading "Account#  Name                          ",&
>>"Purch Date      Amount  Product#"
>xeq
```

```
May 12, 1996 10:10         BC Sales over $100            Page 1

Account#  Name                 Purch Date    Amount    Product#

   10003  Melander   John      19931015      112.07    50511501
   10003  Melander   John      19931015      166.00    50512501
   10003  Melander   John      19931015      219.10    50513001
   10020  Nisbet     Walley    19931001      224.15    50511501
   10020  Nisbet     Walley    19931028      167.13    50512501
```

Suprlink Exercise 1

- From the Store database, find all the British Columbia supplied products that have inventories less than 20
- You should include the product number, quantity in stock, as well as the supplier's name and number

Can I add more information to the report?

- The boss has asked to see product descriptions on the report

```
May 12, 1996  9:18              BC Sales over $100             Page 1

Account#  Name                  Purch Date    Amount    Product#  Product

  10003   Melander    John      19931015      112.07    50511501   Drill
                                19931015      166.00    50512501   Drill
                                19931015      219.10    50513001   Saw
  10020   Nisbet      Walley    19931001      224.15    50511501   Saw
                                19931028      167.13    50512501  Jigsaw
```

Which dataset contains product descriptions?

```
>form sets
Database: STORE.DEMO.ROBELLE
              Set         Item                Entry  Load    Entry
Sets:         Num  Type   Count  Capacity     Count  Factor  Length   B/F
  M-CUSTOMER  1    M      9      211          20     9 %     55       7
  M-PRODUCT   2    M      3      307          13     4 %     24       12
  M-SUPPLIER  3    M      6      211          3      1 %     49       8
  D-INVENTORY 4    D      6      462          13     3 %     15       22
  D-SALES     5    D      8      602          8      1 %     19       14
```

What fields are in the product dataset?

```
>form m-product
Database: STORE.DEMO.ROBELLE
  M-PRODUCT           Master    Set# 2
   Entry:                        Offset
      PRODUCT-DESC           X30      1
      PRODUCT-MODEL          X10     31
      PRODUCT-NO             Z8      41  <<Search Field>>
  Capacity: 307 (12)  Entries: 13  Bytes: 48
```

Selecting the required fields

- We want to read the product-no and product-desc fields in the product master dataset
- We want to read all the fields in Reptfile
- Product-no field is common to both records

Reading product description records

```
>get m-product
>sort product-no
>extract product-no,product-desc
>output prodfile,temp,link
>xeq
```

Re-sorting the invoices on the product field

- Suprlink input and link files must have the same sort key, so the invoices have to be re-sorted on the product-no field

```
>input reptfile
>sort product-no
>output = input
>xeq
```

Linking product descriptions to the invoices

```
>link input reptfile
>link link prodfile
>link output listfile temp
>link xeq
```

How does the new report look?

```
>input listfile
>extract cust-account,name-last,name-first,purch-date,sales-total,product-no
>extract product-desc
>list standard,title "BC Sales over $100",&
>>heading "Account#  Name                          ",&
>>"Purch Date     Amount  Product# and Description"
>sort cust-account
>sort purch-date
>xeq


Account#  Name           Purch Date    Amount  Product# and Description
  10003   Melander  John    19931015    112.07  50511501  Makita 3/8" Var. Speed Drill
  10003   Melander  John    19931015    166.00  50512501  Makita 8 1/4" Circular Saw
  10003   Melander  John    19931015    219.10  50513001  Makita 1" Jigsaw
  10020   Nisbet    Walley  19931001    224.15  50511501  Makita 3/8" Var. Speed Drill
  10020   Nisbet    Walley  19931028    167.13  50512501  Makita 8 1/4" Circular Saw
IN=5, OUT=5. CPU-Sec=1. Wall-Sec=1.
```

Suprlink Exercise 2

- Add the product price to the list in Exercise 1 (page 31)

```
SUPPLIER-   PRODUCT-N ON-HAND-QTY  SUPPLIER-NAME
  5051      50512501           7   Makita Canada Inc.
  5051      50511501           5   Makita Canada Inc.
  5051      50512001           2   Makita Canada Inc.
  5051      50513001           3   Makita Canada Inc.
  5052      50521001          10   Black & Decker
  ...
```

Specifying Link Fields

- You can specify link fields:

```
+ input tranfile by cust-account
+ link custfile by account-num
```

- Useful when files created with ,QUERY instead of ,LINK
- Also useful for specifying a secondary link key:

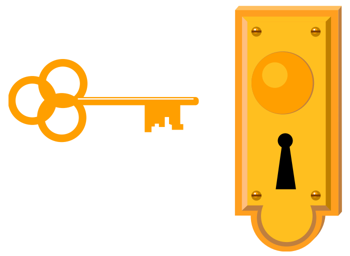
```
+ link majors by ssn cmaj
```

- If field names different in the input file:

```
+ link majors by ssn cmaj from ssn currmaj
```

Suprlink requirements

- Suprlink requires enough disc space for the original database, each input file, the final output file, and hidden Sortscr files
- Input and link files must be self-describing files
- Input and link files must be sorted on the same key field
- Link keys can be any type except a floating-point field type



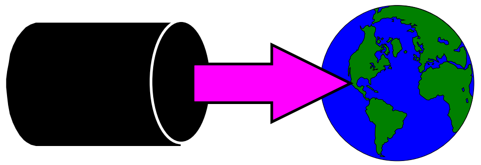
Performance guidelines

- Avoid using Suprlink if repeated sorting is required
- Minimize record sizes by only selecting necessary fields
- Minimize file sizes by only selecting required records

Summary

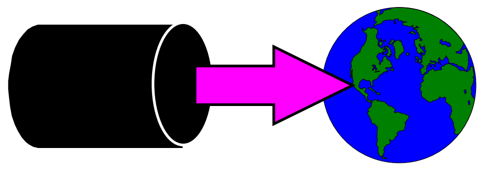
- Suprlink theory
- Input files versus link files
- Implied record selection
- Optional linking
- Adding more information
- Performance tips

Inside Module 7

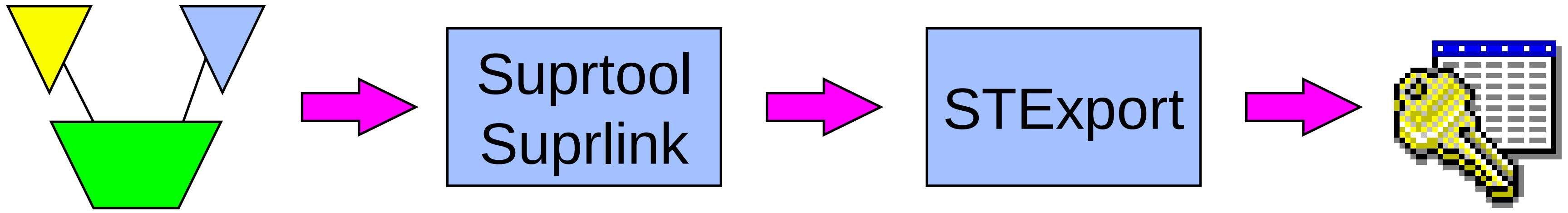


Exporting Data to the World

Exporting Data to other Applications



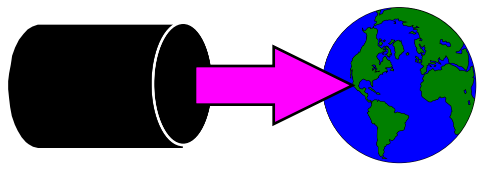
- Extract the data using Suprtool and Suprlink
- Convert the files using STExport
- Transfer the file to the PC
- Import the delimited file



Data needs to be converted

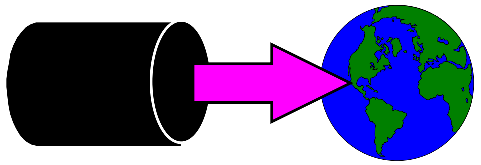
- Image and Eloquence data has:
  - Fixed-width fields
  - Binary storage formats (J2, K2, P28, etc)
  - Structure defined in Root File.
- PC Applications require:
  - Variable-length fields
  - ASCII values for numerics
  - Field delimiters
  - Field name declarations

STExport converts the data



- STExport reads self-describing files
- Outputs ASCII files
- Allows you to specify:
  - field delimiters to use
  - date format
  - fieldnames in first record
  - numeric format
  - fixed or variable length
  - quotes on character fields
  - HTML - *table* or *preformatted*
  - XML output

Ways to run STExport



- **On MPE**
  - From the MPE prompt

    ```
    :run stexport.pub.robelle
    ```

  - From Suprtool

    ```
    >export
    ```

  - From inside of Suprtool

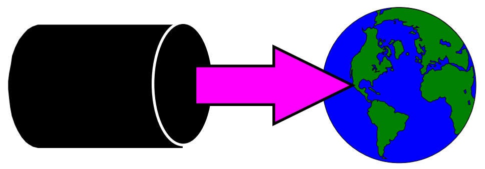
    ```
    >export input custsd
    >export output custexp
    >export exit

    In=20. Out=20. CPU-Sec=1. Wall-Sec=1.
    ```

- **On HP-UX**

  ```
  /opt/robelle/bin/stexport
  ```

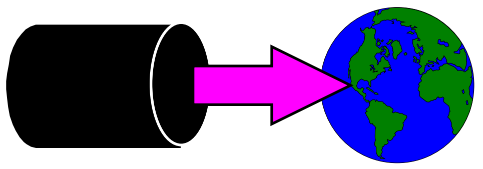
For example ......



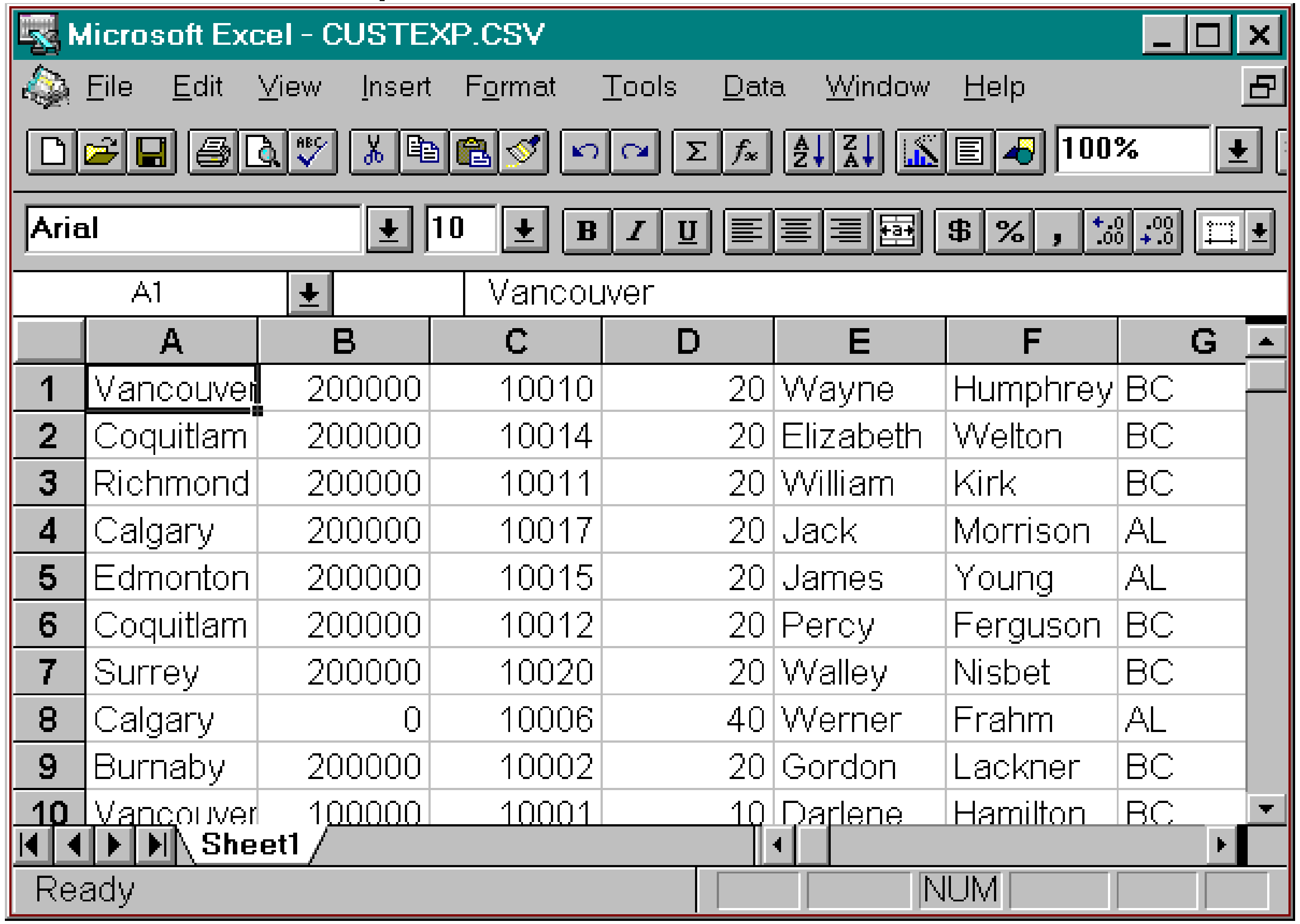
```
>export
$in custsd
$out custexp
$xeq
In=19. Out=19. CPU-Sec=1. Wall-Sec=2.
$print custexp

"Vancouver",200000,10010,"20","Wayne","Humphreys","BC",.....
"Coquitlam",200000,10014,"20","Elizabeth","Welton","BC",.....
"Richmond",200000,10011,"20","William","Kirk","BC",.....
"Calgary",200000,10017,"20","Jack","Morrison","AL",.....
"Edmonton",200000,10015,"20","James","Young","AL",......
"Coquitlam",200000,10012,"20","Percy","Ferguson","BC",.....
"Surrey",200000,10020,"20","Walley","Nisbet","BC",.....
```

In Microsoft Excel



- Transfer to PC, File/Open in Microsoft Excel:



Microsoft Excel - CUSTEXP.CSV
File Edit View Insert Format Tools Data Window Help
100%
Arial
10
A1
Vancouver
Sheet1
Ready
NUM

	A	B	C	D	E	F	G
1	Vancouver	200000	10010	20	Wayne	Humphrey	BC
2	Coquitlam	200000	10014	20	Elizabeth	Welton	BC
3	Richmond	200000	10011	20	William	Kirk	BC
4	Calgary	200000	10017	20	Jack	Morrison	AL
5	Edmonton	200000	10015	20	James	Young	AL
6	Coquitlam	200000	10012	20	Percy	Ferguson	BC
7	Surrey	200000	10020	20	Walley	Nisbet	BC
8	Calgary	0	10006	40	Werner	Frahm	AL
9	Burnaby	200000	10002	20	Gordon	Lackner	BC
10	Vancouver	100000	10001	10	Darlene	Hamilton	BC

Dates and Decimals

- Use Suprtool's ITEM command to qualify the fields:

```
>get d-sales
>item deliv-date,date,YYYYMMDD
>item product-price,decimal,2
>out salesd,link
>x
IN=8, OUT=8. CPU-Sec=1. Wall-Sec=1.
>form salesd
File: SALESD.HANS.TRAINING     (SD Version B.00.00)
      Entry:                     Offset
         CUST-ACCOUNT          Z8      1
         DELIV-DATE            I2      9        <<YYYYMMDD>>
         PRODUCT-NO            Z8     13
         PRODUCT-PRICE         I2     21        << .2  >>
         PURCH-DATE            I2     25 ...etc
```

...... continued

- Specify date format in STEXPORT:

```
>export
$in salesd
$date DDMMYY "/"
$output *
$x
10020,04/10/97,50511501,98.31,19971000,2,2753,22415
10003,16/10/97,50511501,98.31,19971016,1,1376,11207
10003,16/10/97,50512501,145.62,19971016,1,2039,16600
10003,16/10/97,50513001,192.20,19971016,1,2691,21910
10016,20/10/97,50521001,24.59,19971020,3,1033,8411
10016,20/10/97,50532001,139.85,19971020,1,1958,15942
10020,28/10/97,50512501,146.60,19971028,1,2052,16713
10010,20/10/97,50533001,69.92,19971020,1,979,7970
In=8. Out=8. CPU-Sec=1. Wall-Sec=1.
```

Specifying field names

- Use HEADING command to add fieldnames in the first record:

```
$heading '"Description","Model"'
$heading add ',"Product Code"'
$output *
$xeq
   "Description","Model","Product Code"
   "Skil 3/8  Variable Speed Drill","#6523",50531501
   "B&D Router","#7613-04",50522001
   "Skil Var. Sp. Auto-Scroll Saw","#4560",50533001
   "Skil 8 1/2  Circular Saw","#5665",50532501
   .....etc.....
```

- HEADING FIELDNAMES uses Image field names.

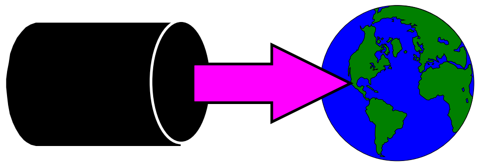
Fixed-length output

- Force fixed-length with COLUMNS command

```
$input prodsd
$columns fixed
$out *
$x
"Description","Model","Product Code"
"Skil 3/8  Variable Speed Drill","#6523"     , 50531501
"B&D Router"                    ,"#7613-04"  , 50522001
"Skil Var. Sp. Auto-Scroll Saw" ,"#4560"     , 50533001
"Skil 8 1/2  Circular Saw"      ,"#5665"     , 50532501
"B&D Cordless Screwdriver"      ,"#9018-04"  , 50521001
```

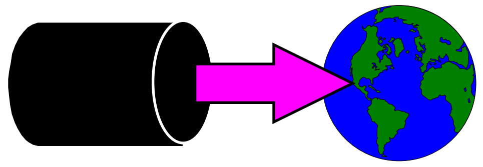
- Also see SPACES and ZERO commands

Preparing Data For The Web



- STExport can create HTML files
- Data can be formatted in a table
  - HTML TABLE command
- Or it can be formatted like a List Standard listing
  - HTML PREFORMATTED command
- Formatting is applied by STExport
  - Numeric data is right justified, with decimal points
  - Alpha data is left justified
  - Dates are formatted as you specify

Preparing HTML Tables

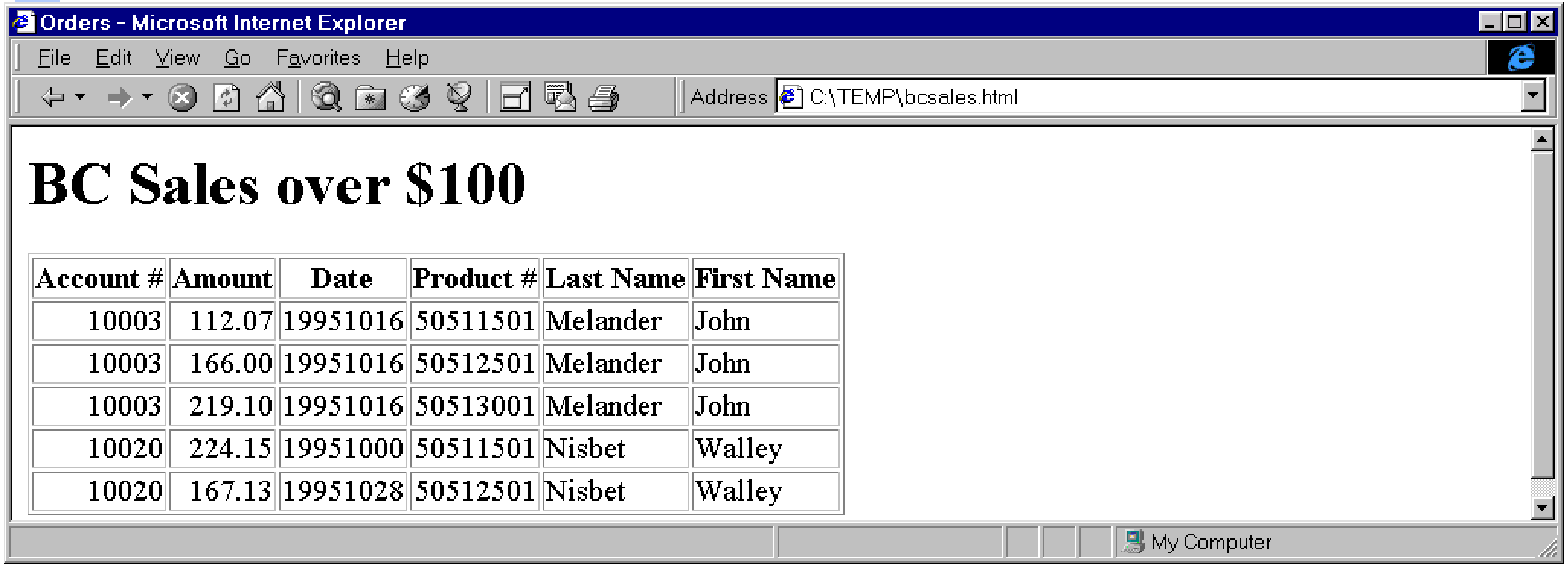


- Use the HTML TABLE command

```
$input reptfile
$heading none
$heading column "Account #"
$heading column "Amount"
$heading column "Date"
$heading column "Product #"
$heading column "Last Name"
$heading column "First Name"
$html table title "Orders" heading "BC Sales over $100"
$output bcsales
$xeq
```

Table With Column Headings

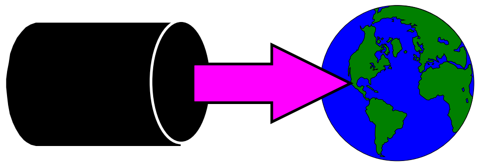
- The table has one column per field, and one row per record


Orders - Microsoft Internet Explorer
File Edit View Go Favorites Help
Address C:\TEMP\bcsales.html
My Computer

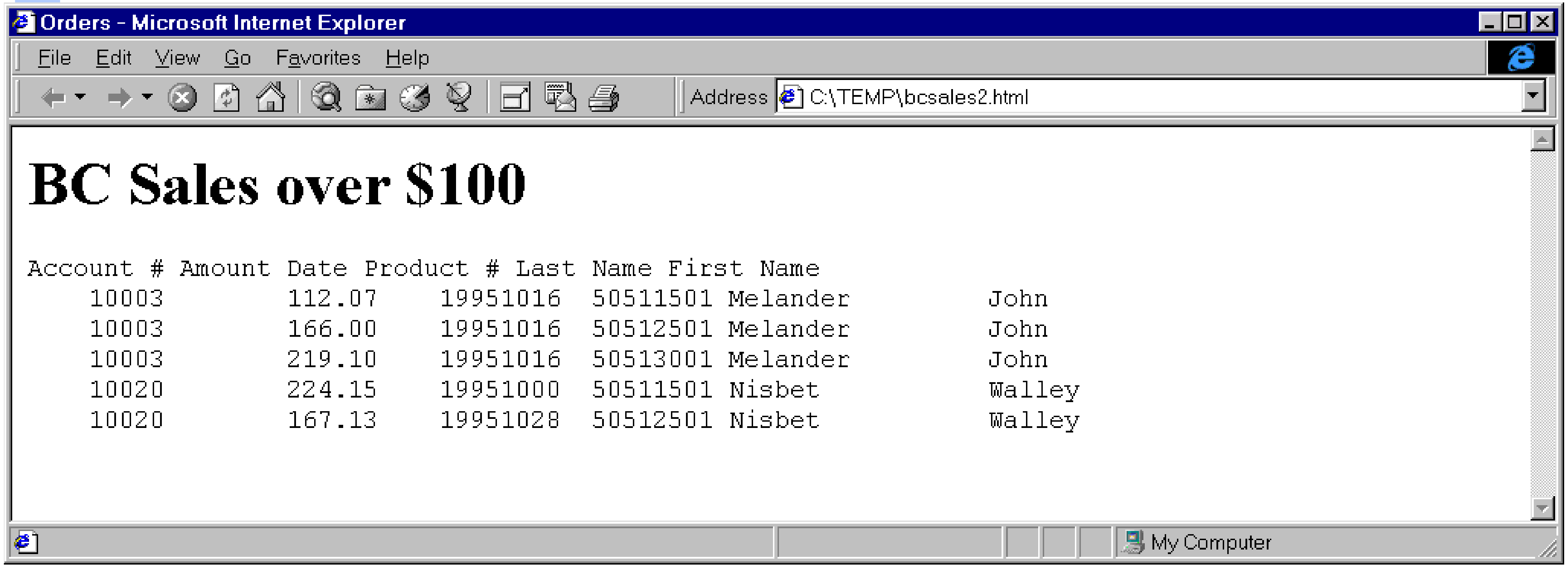
BC Sales over $100

Account #	Amount	Date	Product #	Last Name	First Name
10003	112.07	19951016	50511501	Melander	John
10003	166.00	19951016	50512501	Melander	John
10003	219.10	19951016	50513001	Melander	John
10020	224.15	19951000	50511501	Nisbet	Walley
10020	167.13	19951028	50512501	Nisbet	Walley

Listing-style Data



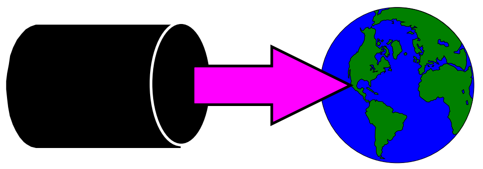
- Use the PREFORMATTED option instead of TABLE


Orders - Microsoft Internet Explorer
File Edit View Go Favorites Help
Address C:\TEMP\bcsales2.html
My Computer

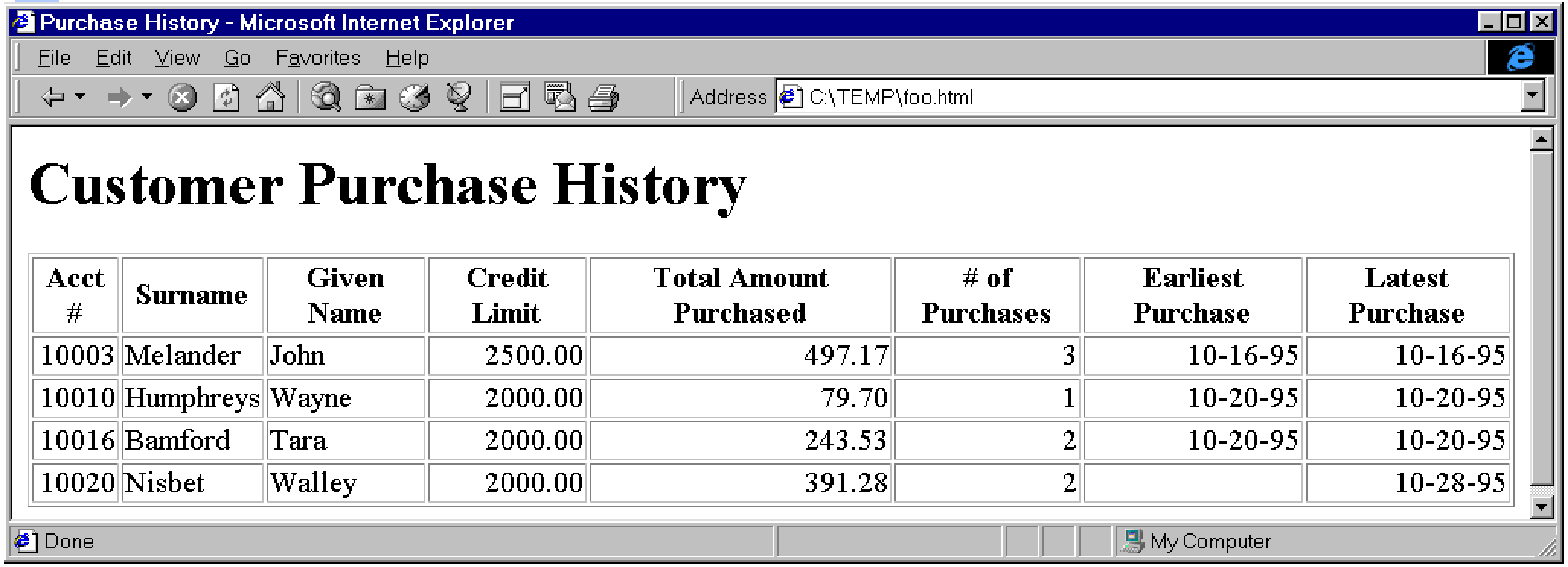
BC Sales over $100

```
Account # Amount Date Product # Last Name First Name
    10003        112.07    19951016  50511501 Melander         John
    10003        166.00    19951016  50512501 Melander         John
    10003        219.10    19951016  50513001 Melander         John
    10020        224.15    19951000  50511501 Nisbet           Walley
    10020        167.13    19951028  50512501 Nisbet           Walley
```

HTML Exercise



- Create an HTML Table that looks like this:


Purchase History - Microsoft Internet Explorer
File Edit View Go Favorites Help
Address C:\TEMP\foo.html
Done
My Computer

Customer Purchase History

Acct #	Surname	Given Name	Credit Limit	Total Amount Purchased	# of Purchases	Earliest Purchase	Latest Purchase
10003	Melander	John	2500.00	497.17	3	10-16-95	10-16-95
10010	Humphreys	Wayne	2000.00	79.70	1	10-20-95	10-20-95
10016	Bamford	Tara	2000.00	243.53	2	10-20-95	10-20-95
10020	Nisbet	Walley	2000.00	391.28	2		10-28-95

Summary of formatting Commands

Command	***Options** (default underlined)*
Columns	Fixed None
Date	None <format> <“*separator*”> <invalid “ “>
Decimal	Period Comma
Delimiter	None Comma Tab “*string*”
Floating	Default Fixed Scientific
Heading	None Fieldnames “*string*” Column “*string*”
HTML	None Preformatted Table
Quote	None Double Single
Sign	None Floating Leading Trailing
Spaces	None Trailing
Zero	None Leading

Settings survive the task ....

Specified settings apply to subsequent tasks

- Suprtool resets most settings at the end of each task
- STExport resets input and output files, but remembers your settings
- Can specify once, and use many times.
- To reset commands, you must set a new preference:

```
heading none
floating default
delimiter comma
```

...etc

XML Command

- XML Output
  - version
  - doctype
  - file
  - record

XML data

```
<?xml version='1.0' encoding='ISO-8859-1'?>
<Orders>
<Details>
<CITY>Los Altos</CITY>
<CREDIT-RATING>100000</CREDIT-RATING>
<CUST-ACCOUNT>4003302</CUST-ACCOUNT>
<CUST-STATUS>20</CUST-STATUS>
<NAME-FIRST>Ralph</NAME-FIRST>
<NAME-LAST>Perkins</NAME-LAST>
<STATE-CODE>CA</STATE-CODE>
<STREET-ADDRESS>Room 655</STREET-ADDRESS>
<STREET-ADDRESS>Los Altos    040033022</STREET-ADDRESS>
<ZIP-CODE>93002</ZIP-CODE>
</Details>
</Orders>
```

Xml Tag Characters

- Special characters in Tags
- Set xmltagchar “.”

New Stuff

- Escape Command
- SQL import
- Some Database Importers require an “escape” character
- STExport takes care of this for you

Clean your Data

- Clean command
- Replaces certain characters with whatever you choose
- Does all byte fields

Summary

- STExport reformats data for other applications
- Controlling STExport’s output layout
- Can be invoked in 3 ways on MPE
- Creating Web Pages
- Resetting defaults

Inside Module 8

Extract basics

- Extract command “extracts” the data from the input source
- Fields are “placed” in the output file in order of the extract commands
- Extract a range of fields
- Extracting constants

Coercion and Numeric Expressions

- Extract also coerces data from the source to the target
- Changes from one data type to another
  - Define display-field,1,8,display
  - Extract display-field = double-field
- Simple Arithmetic functions
  - Extract total = cost * qty
  - Extract budget99 = actual98 + 1000
  - Extract profit = sales-amt – cost
  - Extract average = total / qty
  - Extract day = ccyymmdd-date mod 100

Date $- functions

- $date
  - specify constant or relative date value in various formats
- $today
  - current system date or calculate a date relative to the system date
- $stddate
  - converts a date in any format to CCYYMMDD
- $days
  - converts the date into a Julian format

String $- functions

- $upper
  - converts all alphabetic characters to uppercase
- $lower
  - converts all alphabetic characters to lowercase
- $trim
  - removes leading and trailing spaces
- $ltrim
  - removes leading spaces
- $rtrim
  - removes trailing spaces

Numeric $- functions

- $abs
  - Returns absolute value of a number
- $truncate
  - Returns a number to the left of the decimal place

Extract from a table

- $lookup available in Extract but slightly different
    - Must load the table with data
    - Table mytable,key,file,sdfilename,data(tabledata)
    - File must be self-describing
    - Extract field = $lookup(mytable,key,tabledata)

Extract from a Table Sample

```
>table newprices,prodno,file,bosslist,data(price,desc)
>get part-master
>if $lookup(newprices,prodno)
>update
>extract price = $lookup(newprices,prodno,price)
>extract desc = $lookup(newprices,prodno,desc)
>xeq
```

Summary

- Extract command
- Extract with coercion
- Numeric Expressions
- Extract with $-functions
- Date functions
- String functions
- Numeric functions
- Extract from a table

Inside Module 9

Latest Features in Suprtool

- Variable Substitution
- $Counter
- $Clean and $FindClean
- $Total and $Subtotal
- $SPLIT
- $EDIT
- $NUMBER
- Suprlink's Join Command
- Output,else
- FastRead (non-MPE Platforms)
- Dbedit (non-MPE Platforms)
- List Command (non-MPE Platforms)
- Dynamic Loading of Eloquence (non-MPE Platforms)

Development is a continuous process

- We are always working on new features
- New version every month or so

Variable Substitution

- MPE version has had Variable Substitution for two years
  - Internal MPE routine
  - Same as used by the CI
- HP-UX now has the same feature
  - Suprtool functions take precedence
  - $stddate, $total, $date, $today are not replaced
  - Variable must be set and exported prior to running program
  - Suprtool command line, $read function
  - STExport and Suprlink as well
  - Must have Set Varsub On

$counter function

- Sequential number function
- Allows you to retain original output order

```
> get morder
> def mycount,1,4,double
> ext mycount=$counter
> ext orderno
> out myfile,link
> xeq
```

Clean my data

- $clean function in Suprtool
  - clean “^9”
  - Set cleanchar “ “
  - update
  - extract mybytefield=$clean(mybytefield)

Clean Example

```
>base mydb,1,;
>get customer
>clean "^9","^10","^0","^7"
>set cleanchar " "
>update
>ext address(1) = $clean(address(1))
>ext address(2) = $clean(address(2))
>ext address(3) = $clean(address(3))
>xeq
```

$FindClean Example

- Users did not want to blindly $clean all records
- Some wanted to track strange characters and corruptions
- $FindClean will find fields that could be cleaned

```
>base membrs
>get member-file
>Clean special
>If $findclean(name)
>output toclean,link
>xeq
```

$Total

- $Total and $subtotal functions
- Provide running grand total and subtotals
- Data is stored in a Packed field

$Subtotal

- Syntax for the $subtotal function in the extract command is:
- `extract target = $subtotal(field,sort-field)`
- Must specify a sort
- Sort fields must match

```
>def mytot,1,14,packed
>get orders
>sort ordnum
>ext ordnum
>ext part-number,description,sales-amount
>ext mytot=$subtotal(sales-amount,ordnum)
>out sales,link
>xeq
```

$Split

- $split function
- Extracts out variable length strings from data
- Extract from beginning to “/” character

```
>extract first-name=$split(name,first,”/”)
>extract last-name=$split(name,”/”,last)
```

- Can also split on multiple occurrences of a certain character

Consider the following data:

```
 Armstrong/ Neil/ Patrick
 Green/ Bob/ Miller
 Edwards/ Janine/
 Armstrong/Arthur/Derek
```

$split details

- Occurrence is honored
- No need to specify an occurrence of one
- Can nest inside a $trim or similar string function
- $split does check for overflow
- First and Last keywords available

$edit

- $edit function
- Converts from numeric or byte to formatted string of bytes
- Uses syntax and rules similar to Cobol Edit-Masks
- Placeholders and Format characters
- Two sets of rules byte type and numeric based on source data type

```
 >ext formatdate=$edit(a,"xxxx/xx/xx")
FORMATDATE    = 2003/09/24
```

Numeric source $edit masks

- Numeric source $edit masks

```
>ext a=$edit(int-field,"$$,$$$.99-")
>ext b=$edit(int-field,"99,999.99-")
>ext c=$edit(int-field,"cr99999.99")
>ext d=$edit(int-field,"-$9999.99")
>ext e=$edit(int-field,"**,***.99+")
>ext f=$edit(int-field,"zz,zzz.99+")
>list
>xeq
>IN FILE1SD.NEIL.GREEN (0) >OUT $NULL (0)
A      =    $11.11-     B   = 00,011.11-
C      = CR00011.11     D   =   -$0011.11
E      = ****11.11-     F   =      11.11
```

Handling the sign

- +, -, CR and DB allowed
- Depends on state of the data
- Positive, negative, neutral

Rules for $ sign

- Fixed $ sign edit
- Floating $ edit invoked if two “$$” appear in the edit mask
- Suprtool attempts to fixup most odd cases
  - $,123.45 becomes $123.45

Decimal places

- Data is adjusted to number of decimal places
- Default Decimal symbol is “.”
- Can be changed to “,” or any other single character
- Source field decimal value is honored

Currency symbol and overflow

- Currency symbol can be up to four characters
- Set currencysymbol “$”
- Suprtool by default will not stop if overflow occurs
- Set editstoperror on

$number

- $number function
- Converts free-form numbers to numeric in one step
- Honors signs, decimal places and currency symbols
- This means numbers in New-Price can be read by $number:

```
Item-number    New-Price
   12345          +123.45
   34563          + 27.5
   21312          +  1.545
```

$number details

- Rounding and decimal places
- Error conditions
- Currency, Decimals and thousand symbols

Suprlink

- Combines two files by common key
- Link command allows for many to one relationship
- Join command allows for many to many relationships
- SQL- like feature
- Inner Join
- Outer Join

SQL continued

- Left Outer Join
- Right Outer Join
- Simple Join task

Join continued

- Only one Join per task
- Can specify a secondary key to join on

Output,else

- One Process Output two files
- If condition
- Output,else = if NOT condition
- MPE Temp file
- Other Platforms filename.else

Set FastRead On

- MPE and MR Nobuf
- Set FastRead uses Eloquence Block read routines
- Two to Five times faster
- Less CPU and Wall Time

Dynamic Loading

- Dynamically loads whatever version of Eloquence library you have
- Shlib_path
- Most applications providers set this for you
- Enhancement for the future

Dbedit

- Edit Single Records
- Popular in MPE version for editing/fixing single records
- Now will work with Eloquence databases on HP-UX

Future

- Reporting?
- More work in a single pass

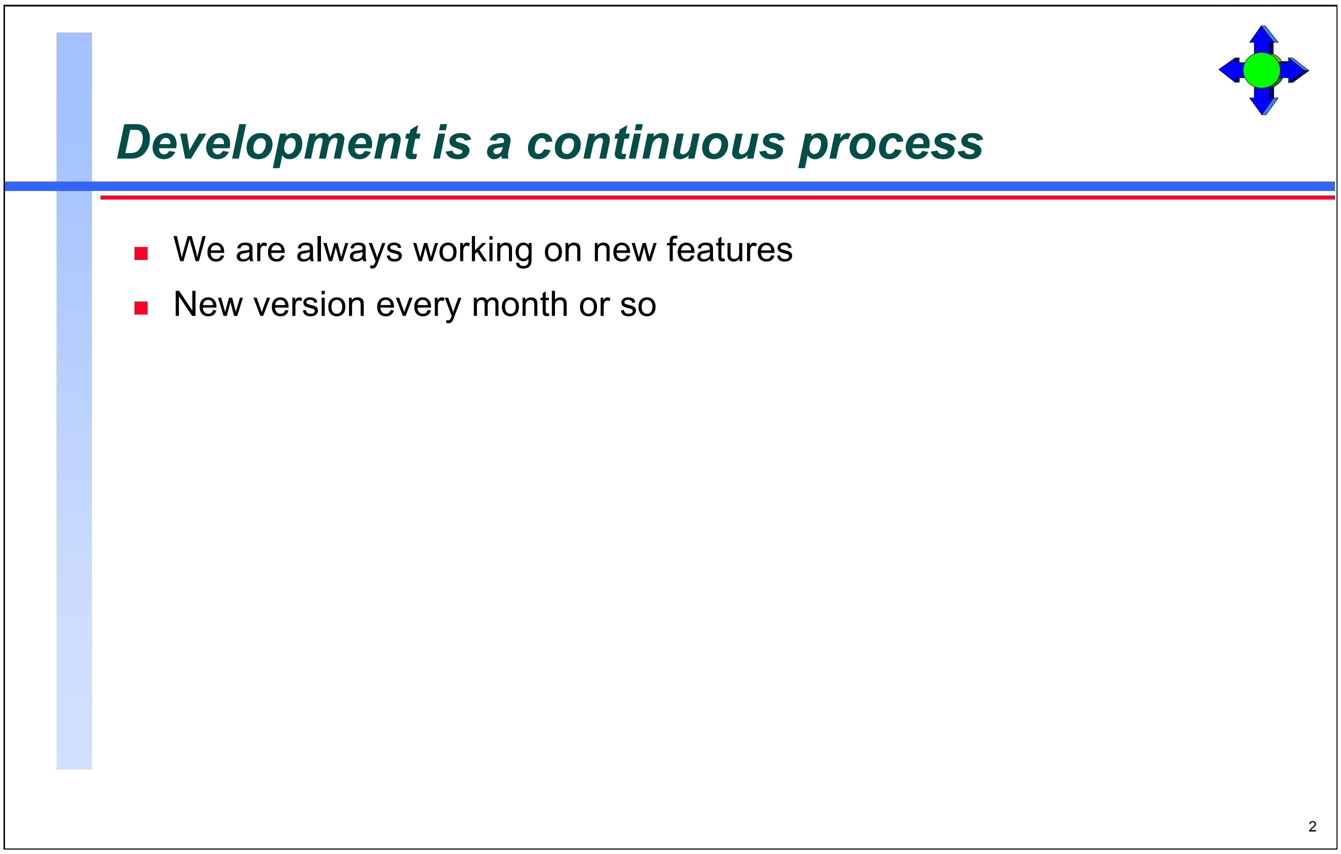
Inside Module 9

Latest Features in Suprtool

- The latest and greatest features
- Variable Substitution
- $total
- $counter
- $Clean

For Techies

References



Development is a continuous process

- We are always working on new features
- New version every month or so

2

We constantly improve and work on our products. Suprtool is no exception. There are always new features being planned, designed, worked on and implemented. This section is to give you up-to-the-minute progress report on some of the latest features in Suprtool.

For Techies

References

Variable Substitution

- MPE version has had Variable Substitution for two years
  - Internal MPE routine
  - Same as used by the CI
- HP-UX now has the same feature
  - Suprtool functions take precedence
  - $stddate, $total, $date, $today are not replaced
  - Variable must be set and exported prior to running program
  - Suprtool command line, $read function
  - STExport and Suprlink as well
  - Must have Set Varsub On

Suprtool, STExport and Suprlink on MPE have had Variable Substitution for over two years now. We have recently added Variable Substitution for the three programs on HP-UX. The feature is invoked in the same manner, >Set Varsub On. However, you cannot have an environment variable resolved if it has the same name as a Suprtool function, such as $date, $stddate etc.

For Techies

References

$counter function

- Sequential number function
- Allows you to retain original output order

```
> get morder
> def mycount,1,4,double
> ext mycount=$counter
> ext orderno
> out myfile,link
> xeq
```

For years, Suprtool has had the ability to output a record number to an output file with the num option of the output command:

```
>in mysdfile
>out myfile,num,data
```

The above could would generate an output file called myfile, however, you would lose the SD information and you can only put the number at the beginning or the end of the data. Suprtool now has a counter function that allows you to place a $counter anywhere in the output record as well as preserve the SD information.

```
>in mysdfile
>def mycount,1,4,double
>ext field1
>ext field2
>ext mycount=$counter
>out myfile,link
>xeq
```

The file myfile will be self-describing and contain the fields field1, field2 and mycount. The field mycount is defined as a double integer, since this is the only field type that the $counter function can use. Each record will have a unique ascending number starting at one.

For Techies

References

Clean my data

- $clean function in Suprtool
  - clean “^9”
  - Set cleanchar “ “
  - update
  - extract mybytefield=$clean(mybytefield)

The Clean command is used to tell Suprtool which characters it needs to look for in a given byte type field. For example:

```
clean "^9","^10","."
```

tells Suprtool to replace all occurrences of the tab character (Decimal 9), LineFeed (Decimal 10) and periods to whatever the Clean character is set to.

The Clean command takes both, decimal notation and the character itself. However, it is probably most convenient to use the Decimal notation for the characters that you wish to clean. The Decimal notation is indicated by the caret "^" character. By default, Suprtool replaces any of the characters specified in the clean command with a space. You can change the replacement character with the following set command:

```
>set CleanChar ".“
```

This command sets the replacement character to a period. You call the clean function the same way you normally use other functions available to If and Extract. For example:

```
>extract address1=$clean(address1)
```

For Techies

References

Clean Example

```
>base mydb,1,;
>get customer
>clean "^9","^10","^0","^7"
>set cleanchar " "
>update
>ext address(1) = $clean(address(1))
>ext address(2) = $clean(address(2))
>ext address(3) = $clean(address(3))
>xeq
```

The above task will look at the three instances of address and replace all occurrences of the tab, linefeed, null and bell characters with a space.

For Techies

References

Suprtool2

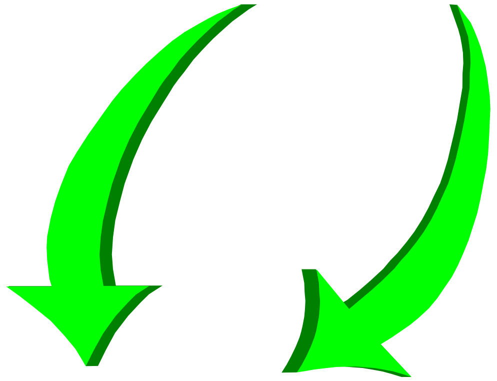
Programming with Suprtool2

Calling Suprtool from a program

- There are two ways to execute Suprtool commands for a program:

1. Run Suprtool first, then run the program

2. Have the program call Suprtool2



Invoking Suprtool for an end-user

- Any 3GL program can invoke Suprtool tasks, including COBOL, QUICK, FORTRAN, TRANSACT, and SPL
- Call the Suprtool2 interface routine

```
procedure suprtool2 (suprcontrol);
  array suprcontrol;
```

- Each call to Suprtool2 passes one line of commands that can include MPE or Suprlink commands
- Suprtool functions are invisible to the end-user

Suprtool2 control Parm

```
01 supr-control.
   05 supr-version              pic s9(4) comp value 4.
   05 supr-status               pic s9(4) comp.
      88  supr-ok               value zeros.
      88  supr-bad-msgfile          value 1.
      88  supr-aborted              value 2.
      88  supr-create-error         value 3.
      88  supr-bad-total-type         value 4.
   05 supr-command-line         pic x(256) value spaces.
   05 supr-flags.
      10  supr-priority         pic x(2) value spaces.
          88 supr-priority-cs       value "CS".
          88 supr-priority-ds       value "DS".
          88 supr-priority-es       value "ES".
```

{continued}

Suprtool2 control Parm continued

```
      10 supr-maxdata          pic s9(9) comp value 0.
      10 supr-print-state      pic x(2) value "ER".
         88 supr-print-on-error          value "ER".
         88 supr-print-always     value "AL".
         88 supr-print-never      value "NE".
      10 supr-total-type       pic x(2) value "CO".
         88 supr-total-cobol      value "CO".
         88 supr-total-ascii      value "AS".
      10 supr-other-flags      pic x(18) value spaces.
   05 supr-totals pic s9(17) sign is trailing
              separate character occurs 15 times.
   05 supr-out-count           pic s9(9) comp.
   05 supr-workspace           pic x(20) value spaces.
```

Calls to Suprtool2 from a COBOL program

```
$include cobol.qlibsrc.robelle

00-main section.
   perform 02-get-if-specs.
   move "base invory.data,5,dev" to supr-command-line.
                    perform 01-call-suprtool.
   move "get invrec"          to supr-command-line.
                    perform 01-call-suprtool.
   move if-command            to supr-command-line.
                    perform 01-call-suprtool.
   move "purge selitem"        to supr-command-line.
                    perform 01-call-suprtool.
```

{continued}

Calls to Suprtool2 from a COBOL program continued

```
     move "output selitem"       to supr-command-line.
                             perform 01-call-suprtool.
     move "extract item,descript"     to supr-command-line.
                             perform 01-call-suprtool.
     move "sort item"                 to supr-command-line.
                             perform 01-call-suprtool.
     move "exit"                      to supr-command-line.
                             perform 01-call-suprtool.
```

- Actual call to Suprtool

```
01-call-surtoool.
   call "Suprtool2" using supr-control.
   if not supr-ok then
      display "Suprtool interface error number: ", supr-status.
```

Prompting users for selection criteria from a COBOL program

- Use a buffer to format the IF command

```
01 if-command.
   05 filler  pic x(9) value "IF ITEM=‘".
   05 sel-prefix    pic x(4).
   05 filler  pic x(2) value "‘ ".
```

- Code to insert selection criteria into the IF buffer

```
02-get-if-specs.
   display "Enter 4-character item prefix to select:".
   accept input-buf.
   move input-buf to sel-prefix.
```

- Code in main program

```
perform 02-get-if-specs.
move if-command to supr-command-line.
perform 01-call-suprtool.
```

Installing Suprtool2 on MPE V

- MPE V uses the CM version of Suprtool2

```
:run cmprog;lib = p

:segmenter                  {load into your SL file}
-sl sl.pub
-purgesl segment,suprtool
-usl st2usl.pub.robelle
-addsl suprtool
-exit
```

Installing Suprtool2 on MPE/iX

- MPE/iX uses the NM version of Suprtool2
- Run your programs with

```
:run nmprog;xl = "st2xl.pub.robelle"
```

- Or copy the module to your own XL file

```
:linkedit
-xl xl.pub
-copy xl;from = st2xl.pub.robelle;& replace
-exit
```

Three ways COBOL programs can use Suprtool

- Batch report programs
  - Run Suprtool and create an output file
  - Read and format output file
- On-line programs
  - Call Suprtool2 routine
  - Pass commands to a Suprtool child process
  - Read Suprtool output file
- Call Speed Demon routine instead of DBGET to read every record

Summary

- Call Suprtool2 routine
- Execute Suprtool program as a child process
- Read results from a file created by Suprtool

Dbedit

Editing TurboIMAGE Datasets

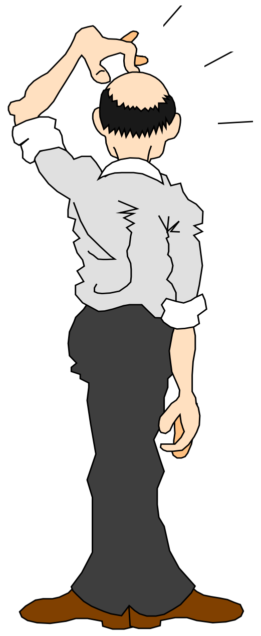
Editing a database with Dbedit

- Dbedit uses simple commands to perform these editing operations:
    - listing entries
    - adding an entry
    - modifying an entry
    - deleting an entry
    - applying global changes to entries

- It can work on chains of entries or related entries
- It can modify key items

How can Dbedit help me with my work?

- Dbedit is useful in many ways
  - Debugging programs
  - Fixing bad data
  - Building prototype databases



Accessing Dbedit

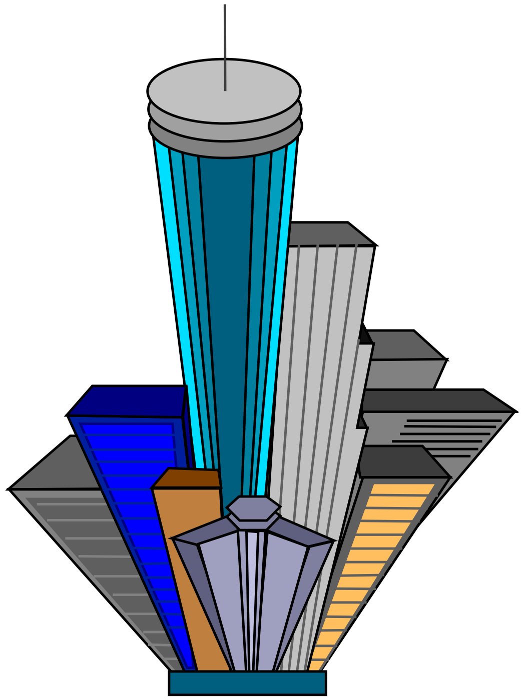
- Step 1: Run Suprtool
- Step 2: Use the BASE command to open a database
- Step 3: Use the EDIT command to start Dbedit

```
:run suprtool.pub.robelle
>base store.pub
>edit
#                    {Dbedit prompt}
```

Dbedit is built into Suprtool

- Dbedit is a Suprtool component that functions independently
- Dbedit commands:

```
#form sets
#list m-customer
#modify d-sales;updatekey
#add d-inventory
#delete
#change m-product
#exit
```



Finding an entry with a known key

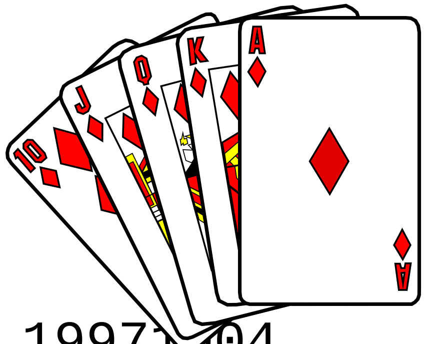
- Use LIST *setname* and specify a key value at the prompt

```
  #list m-customer
List in File: M-CUSTOMER
CUST-ACCOUNT      >10020_______
CITY         = Surrey         CREDIT-RATING   = 200000
CUST-ACCOUNT = 10020          CUST-STATUS     = 20
NAME-FIRST   = Walley         NAME-LAST       = Nisbet
STATE-CODE   = BC
STREET-ADDRESS  = 8877-149th Street
            (2)
POSTAL-CODE     = V3T4W2

List in File: M-CUSTOMER
    CUST-ACCOUNT       >______Prompts for next value__________
```

Finding a chain of entries

- Use LIST *setname* to specify a chain of entries

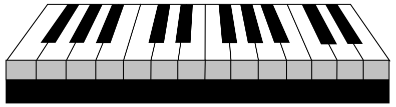


```
#list d-sales
List in File: D-SALES
  CUST-ACCOUNT        >10020____
    PRODUCT-NO        >_____{press return to omit}____
CUST-ACCOUNT    = 10020          DELIV-DATE       = 19971004
PRODUCT-NO      = 50511501       PRODUCT-PRICE    = 9831
PURCH-DATE      = 19971000       SALES-QTY        = 2
SALES-TAX       = 2753           SALES-TOTAL      = 22415

CUST-ACCOUNT    = 10020          DELIV-DATE       = 19971028
PRODUCT-NO      = 50512501       PRODUCT-PRICE    = 14660
PURCH-DATE      = 19971028       SALES-QTY        = 1
SALES-TAX       = 2052           SALES-TOTAL      = 16712
List in File: D-SALES
    CUST-ACCOUNT      >______{press return to end}___
```

How can I change the search key?

- Use the KEY option to specify a different key and alter the search path



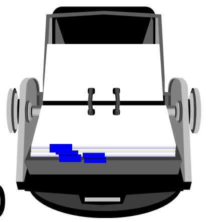
```
  #list d-sales;key = product-no
List in File: D-SALES
    PRODUCT-NO          >50512501_
    CUST-ACCOUNT        >________{enter value or press return}_
CUST-ACCOUNT      = 10003               DELIV-DATE       = 19971016
PRODUCT-NO        = 50512501            PRODUCT-PRICE    = 14562
PURCH-DATE        = 19971016            SALES-QTY        = 1
SALES-TAX         = 2039                SALES-TOTAL      = 16601

CUST-ACCOUNT      = 10020               DELIV-DATE       = 19971028
PRODUCT-NO        = 50512501            PRODUCT-PRICE    = 14660
PURCH-DATE        = 19971028            SALES-QTY        = 1
SALES-TAX         = 2052                SALES-TOTAL      = 16712

List in File: D-SALES
      PRODUCT-NO          >_________
```

What if I don't know the key value?

- Use the ALL option to sequentially display all the entries in a dataset



```
  #list m-customer;all
List ALL records in File: M-CUSTOMER
CITY              = Vancouver      CREDIT-RATING   = 200000
CUST-ACCOUNT      = 10010          CUST-STATUS     = 20
NAME-FIRST        = Wayne          NAME-LAST       = Humphreys
STATE-CODE        = BC
STREET-ADDRESS    = #403-1075 Comox
            (2)
POSTAL-CODE       = V5T1H6

CITY              = Coquitlam      CREDIT-RATING   = 200000
CUST-ACCOUNT      = 10014          CUST-STATUS     = 20
NAME-FIRST        = Elizabeth      NAME-LAST       = Welton
STATE-CODE        = BC
STREET-ADDRESS    = 2788 Oxtoby Place
.....etc....
```

Listing related entries from other datasets

The RELATED option with the LIST command searches for entries in the selected dataset and in related datasets

- If a master dataset is specified, Dbedit retrieves a master entry and then goes through the paths to detail sets

```
      #list m-customer;related
```

- If a detail dataset is specified, Dbedit retrieves a detail chain, then goes through the paths from master sets

```
      #list d-sales;related
```

Changing a noncritical field

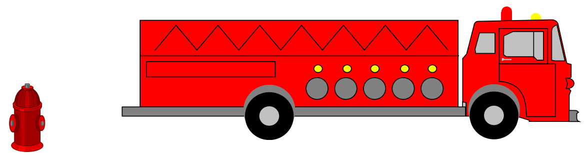
- Use the MODIFY command to change the values of noncritical fields in a record

```
#modify d-inventory : unit-cost
Modify within File: D-INVENTORY
  SUPPLIER-NAME   >STD Ribbons
  PRODUCT-NO      >105391
Enter new values(or <Return> to leave as is):
  SUPPLIER-NAME   = STD Ribbons
  PRODUCT-NO      = 105391
  UNIT-COST       = 500
                     _____  {enter new unit cost}
```

How can I modify a critical field?

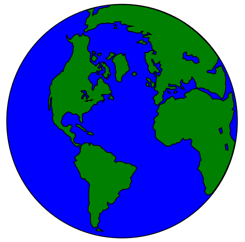
- Use the UPDATEKEY option to modify critical items

```
#modify d-inventory;updatekey
Modify within File: d-inventory
   SUPPLIER-NAME >*________ {no new value}
   PRODUCT-NO    >_________ {press Return to omit}
Enter new values (or <Return> to leave as is):
   SUPPLIER-NAME  = STD Ribbons
                    STD Ribbon  {new key value}
```



Can I make a global change to a field?

- If you need to change a field value in the entire dataset, use the CHANGE command



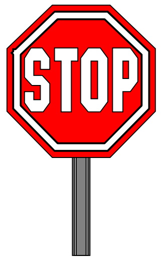
```
#change m-supplier
Enter existing key value to find:
  SUPPLIER-NAME >ACME
Enter new key value to replace with:
  SUPPLIER-NAME >ACME SUPPLY

SUPPLIER-NAME = ACME  CITY      = Los Angeles
STATE-CODE    = CA    STREET(1) = 100 Main
STREET(2)     =       ZIP-CODE  = 91201
  OK to change this entry[no]:Y
```

Subcommands in Dbedit

- In response to the Dbedit prompt for a field value, you can use the following subcommands:

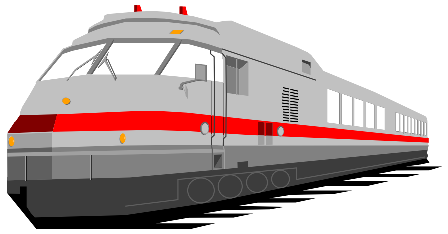
*	No new value
?	Display the TurboIMAGE format or field
//	Quit the command
\\	Quit the command
Ctrl-Y	Quit the command
[	Treat rest of line as data, not as subcommand
'	Set this field to all blanks (batch use)
=	Execute a calculator command



Moving around in a field list

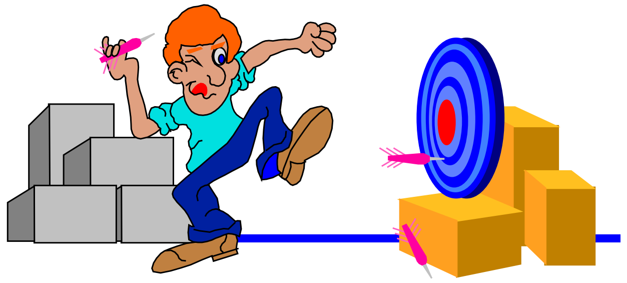
- Try these subcommands to move to other entries in a field list:

>>	Go to the end of the field list
<<	Go to the beginning of the list
>3	Go three fields forward in the list
<3	Go three fields back in the list
@fieldname	Go to the fieldname



Adding new entries to a dataset

- Use the ADD command to insert a new record into a dataset



```
#add m-supplier
Add to File: M-SUPPLIER
  SUPPLIER-NAME >ACME
  CITY          >Los Angeles
  STATE-CODE    >CA
  STREET(1)     >100 Main
  STREET(2)     >_______   {press Return to omit}
  ZIP-CODE      >91201
```

How can I delete an entry?

- It's easy to remove an entry using the DELETE command

```
#delete m-supplier
Delete from File: M-SUPPLIER
SUPPLIER-NAME >ACME
SUPPLIER-NAME = ACME  CITY         = Los Angeles
STATE-CODE    = CA    STREET(1)= 100 Main
STREET(2)     =       ZIP-CODE  = 91201

Is this the entry to delete[no]:Y
```

MPE/iX Critical Item Update (CIU)

- CIU allows programs to modify critical search and sort fields in detail datasets using DBUPDATE
- By default, IMAGE databases have CIU disabled
- Dbedit requires CIU for the CHANGE command and the UPDATEKEY option with the MODIFY command
- Two ways to enable CIU
  1. **`set`** ***`basename`*** **`ciupdate = on`**
  2. **`set`** ***`basename`*** **`ciupdate = allowed`**

General guidelines

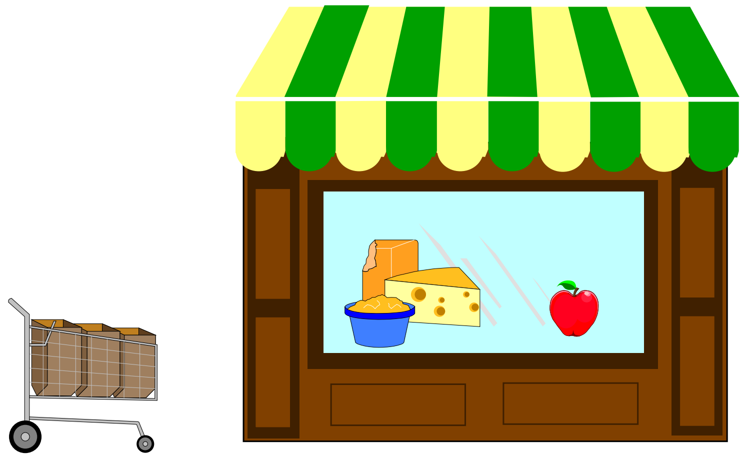
- Dbedit works best on single entries or chains of entries
- Dbedit uses keyed access, but serial access can be specified with the LIST ALL command
- All Dbedit commands support the asterisk (*) subcommand
- All commands support a restrictive field list
- A semicolon (;) separates a command from its options

Summary

- Like a text editor for dataset entries
- ADD, CHANGE, DELETE, LIST, MODIFY
- Updating key values

Exercise

- Open the Store database and copy the m-customer dataset into a file called Custfile
- Then look at the contents of Custfile



Exercise
GET versus CHAIN: quick, choose one!

- Ord-Line detail dataset has2.3 million records of 308 bytes
- Ordfile has 162,000 key values which will select 261,000 records

-
  ```
  chain  ord-line,ord-num=my-table
  table  my-table,ord-num,file-ordfile
  output myfile
  xeq
  ```

-
  ```
  get    ord-line
  table  my-table,ord-num,file,ordfile
  if     $lookup(my-table,ord-num)
  sort   ord-num
  output myfile
  xeq
  ```

Exercise
Create a listing of the Alberta customers

- Create the following report from the STORE database:

```
Mar 20, 1995 20:32      Alberta Customers       Page 1

Account#  Name             City
   10004  Rogers           Edmonton
   10005  Coyle            Edmonton
   10006  Frahm            Calgary
   10007  Tiernan          Calgary
   10015  Young            Edmonton
   10016  Bamford          Edmonton
   10017  Morrison         Calgary
   10018  Johnston         Calgary
```

Exercise
Duplicates, Duplicates, Duplicates, Duplicates

- Exercise 1: Create a list of all the states/provinces in which we have customers.
- Exercise 2: List all the dates on which we made more than one sale.
- Bonus Exercise 3: List all the sales made on those dates. Hints: requires two passes, and the Table command

Suprlink Exercise 1

- From the Store database, find all the products of British Columbia suppliers with inventories less than 20
- You should include the product number, quantity in stock, as well as the supplier's name and number

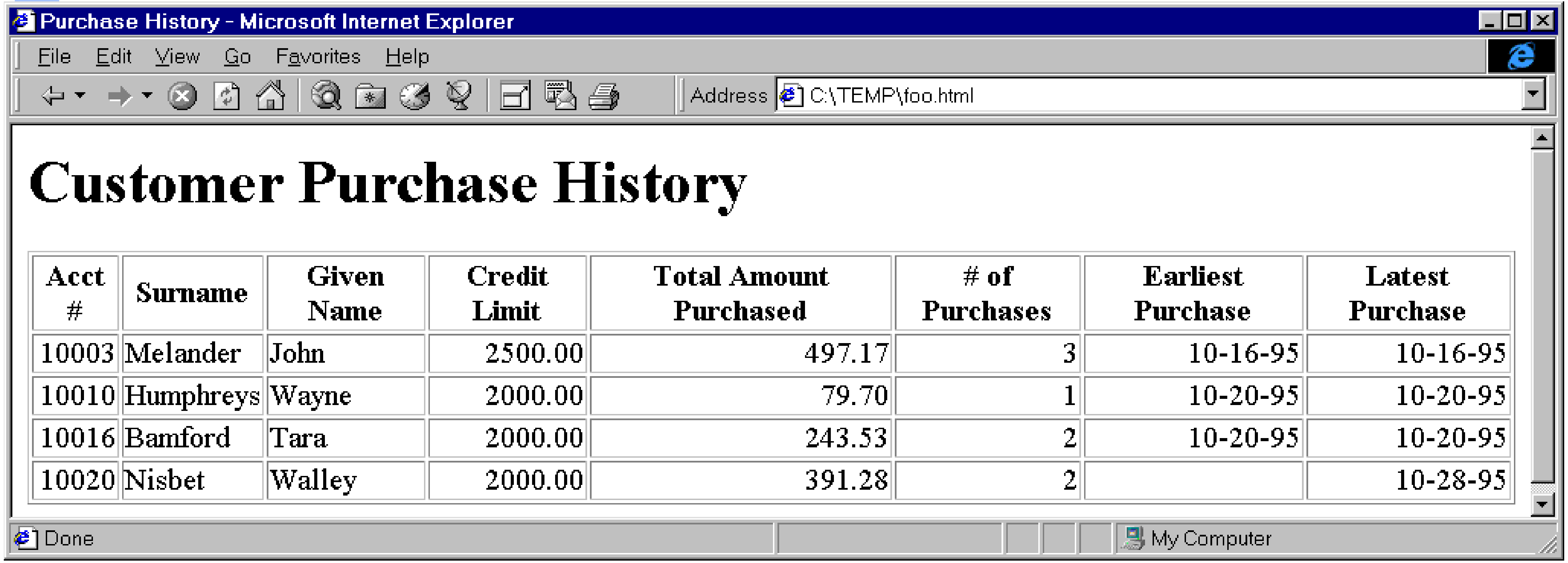
Suprlink Exercise 2

- Add the product price to the list in Exercise 1 (page 31)

```
SUPPLIER-   PRODUCT-N ON-HAND-QTY  SUPPLIER-NAME
  5051      50512501           7   Makita Canada Inc.
  5051      50511501           5   Makita Canada Inc.
  5051      50512001           2   Makita Canada Inc.
  5051      50513001           3   Makita Canada Inc.
  5052      50521001          10   Black & Decker
  ...
```

HTML Exercise

- Create an HTML Table that looks like this:


Purchase History - Microsoft Internet Explorer
File Edit View Go Favorites Help
Address C:\TEMP\foo.html
Done
My Computer

Customer Purchase History

Acct #	Surname	Given Name	Credit Limit	Total Amount Purchased	# of Purchases	Earliest Purchase	Latest Purchase
10003	Melander	John	2500.00	497.17	3	10-16-95	10-16-95
10010	Humphreys	Wayne	2000.00	79.70	1	10-20-95	10-20-95
10016	Bamford	Tara	2000.00	243.53	2	10-20-95	10-20-95
10020	Nisbet	Walley	2000.00	391.28	2		10-28-95

HowMessy Exercise #1 (Master)

Data Set	Type	Capacity	Entries	Load Factor	Secon-daries (Highwater)	Max Blks	Blk Fact
A-MASTER	Ato	14505679	9709758	66.9%	36.8%	2395	29

Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
MASTER-KEY	37	1.58	1.26	1.00	1.88	48.5%	1.88

HowMessy Exercise #2 (Detail)

```
                                                        Secon-Max
               Type                            Load    daries Blks    Blk
Data Set                Capacity    Entries   Factor   (Highwater)   Fact

D-ITEMS         Det       620571     119213    19.2%   (    242025)      7

                    Max     Ave     Std    Expd     Avg    Ineff   Elong-
       Search Field Chain   Chain   Dev   Blocks  Blocks   Ptrs    ation

     S !          ITEM-NO       3   1.00    0.02    1.00    1.00    0.0%     1.00
     S SUPPLIER-NO     23___8.07__3.25    1.77    3.30   28.4%    1.86
       LOCATION      5938   11.62  63.64    2.24    2.53   13.2%    1.13
       BO-STATUS    9999999999.99  0.0017031.0017047.00  14.3%    1.00
       DISCOUNT     99999  120.181337.15    3.73   39.37   31.9%   10.55
```

HowMessy

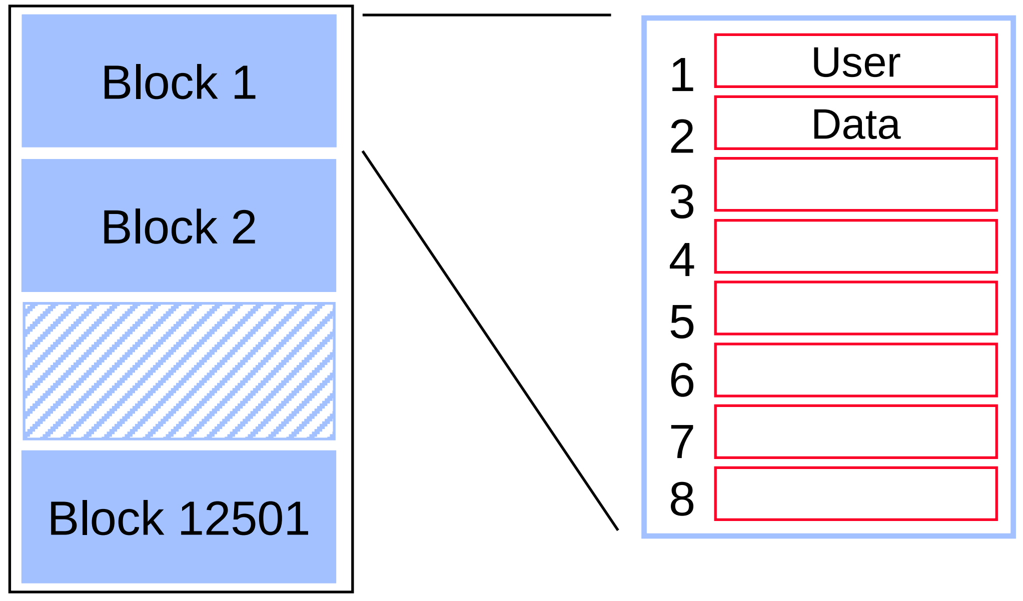
How Messy is Your Database

How messy is your database?

- A database is messy if it takes more I/O than it should
- Unnecessary I/O is still a major limiting factor even on MPE/iX machines
- Databases are messy by nature
- Run HowMessy or DBLOADNG against your database
  - HowMessy is a bonus program for Robelle customers
  - DBLOADNG is a contributed library program

Blocks

- TurboIMAGE does all I/O operations in blocks
- A block may contain many user records
- More entries per block means fewer I/Os
- Fewer I/Os means better performance



Capacity: 100001

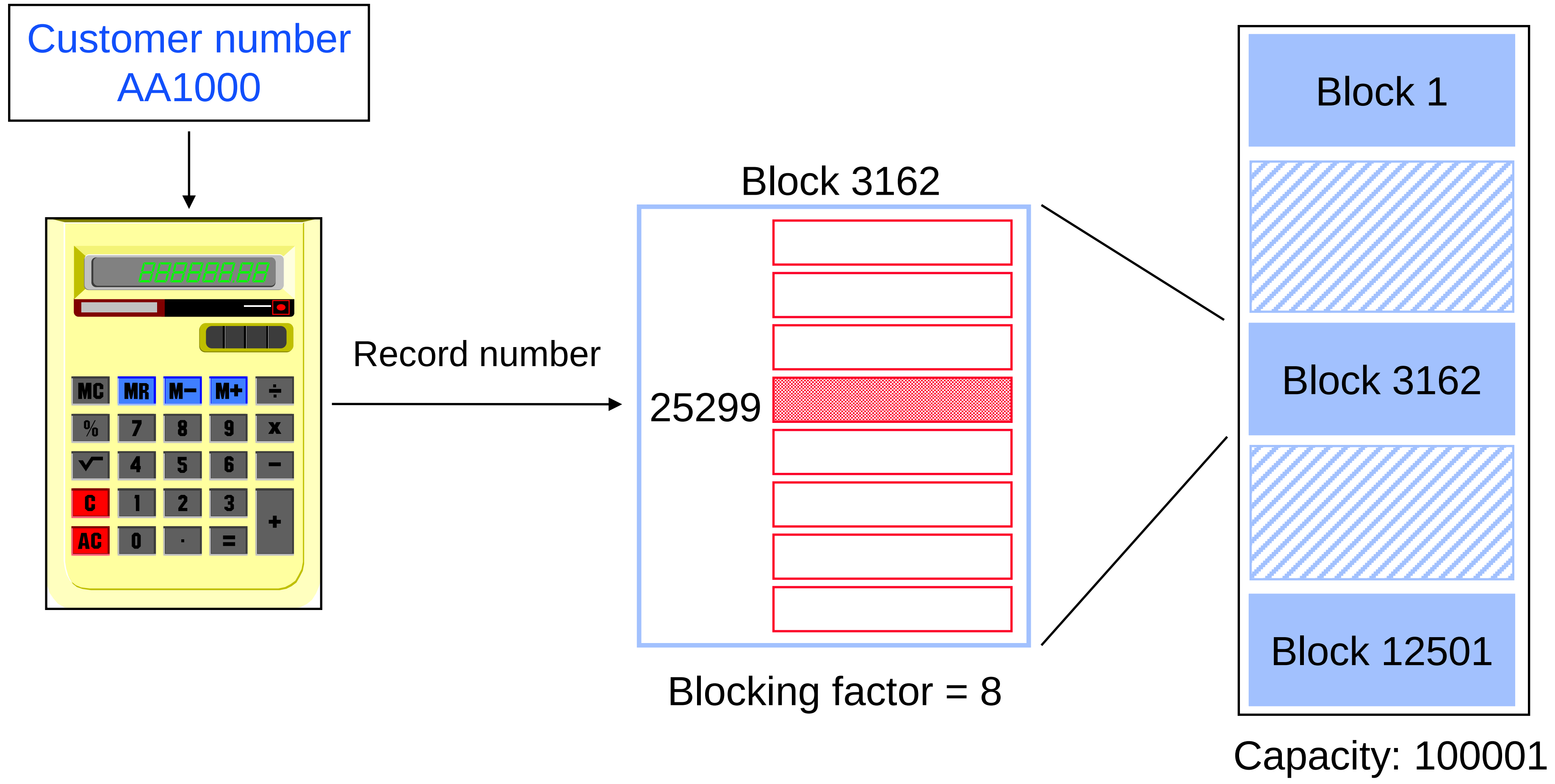
Blocking factor = 8

Record location in masters

- Search item values must be unique
- Location of entries is determined by a hashing algorithm or a primary address calculation
- Calculation is done on search item value to transform it into a record number between one and the capacity
- Different calculation depending on the search item type
    - X, U, Z, and P give random results
    - I, J, K, R, and E give predictable results

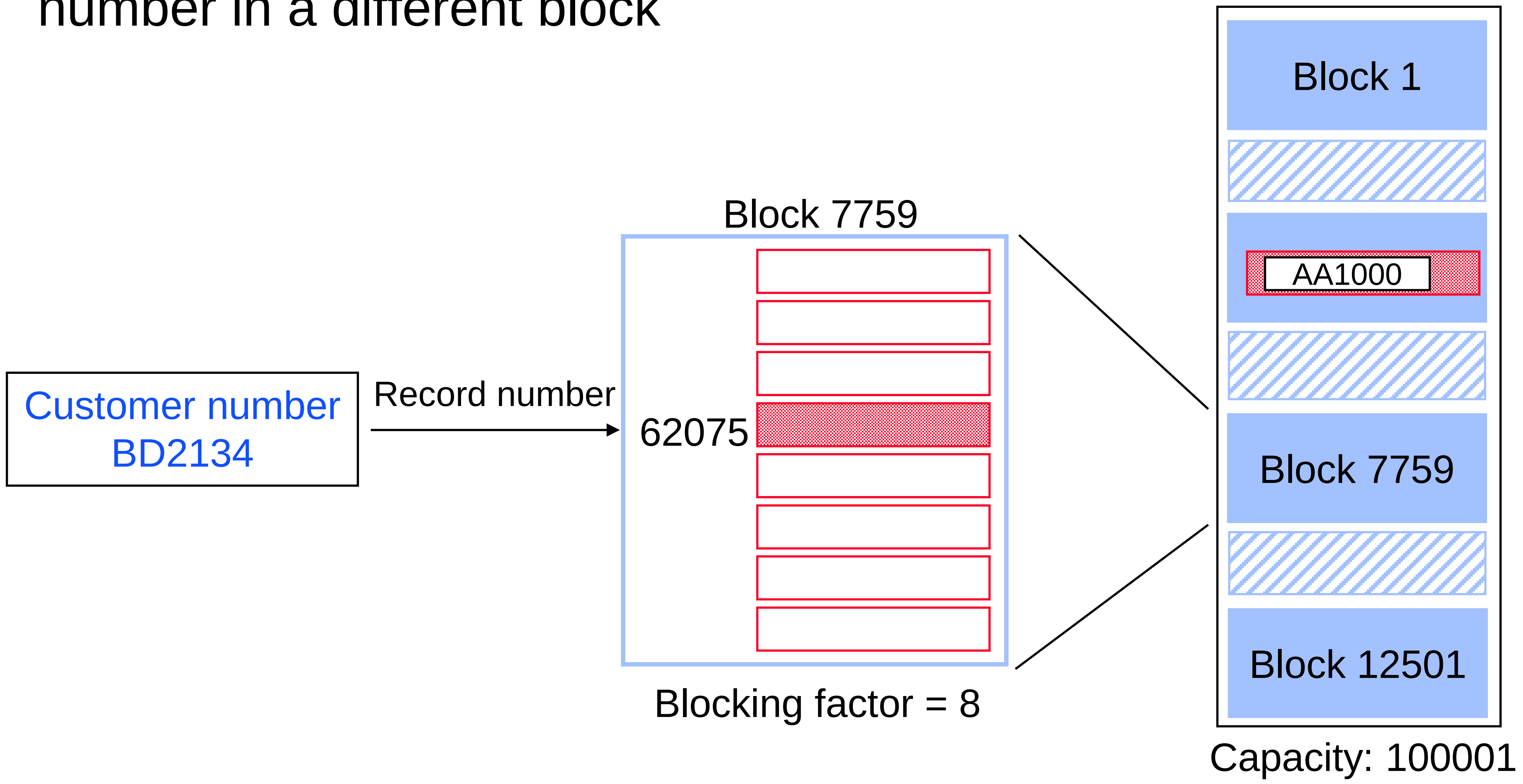
Hashing algorithm

- Customer number AA1000 is transformed into a record number



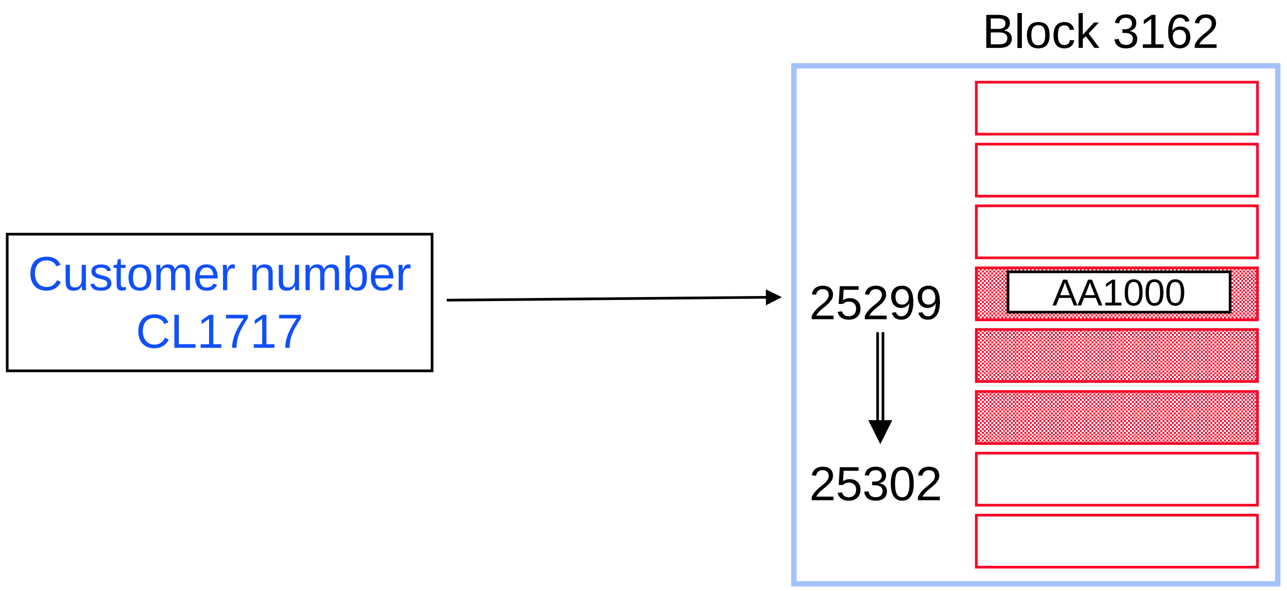
Hashing algorithm (no collision)

- Customer number BD2134 gives a different record number in a different block



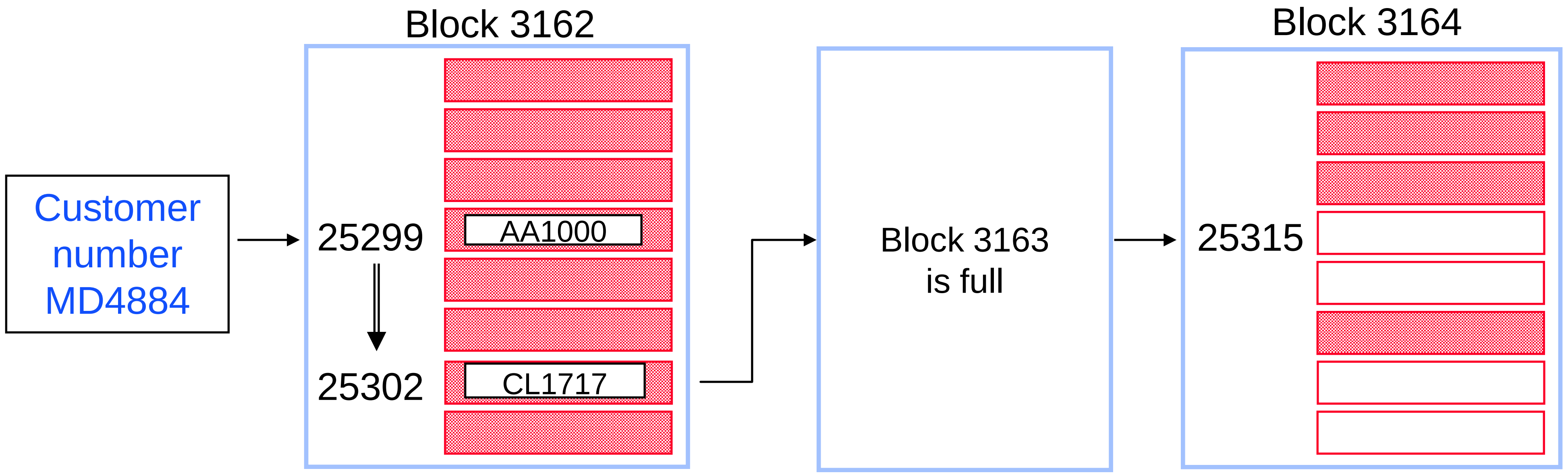
Hashing algorithm (collision - same block)

- Customer number CL1717 hashes to the same record number as AA1000 location
- TurboIMAGE tries to find an empty location in the same block. If it finds one, no additional I/O is required.
- CL1717 becomes a secondary entry. Primary and secondary entries are linked using pointers that form a chain.

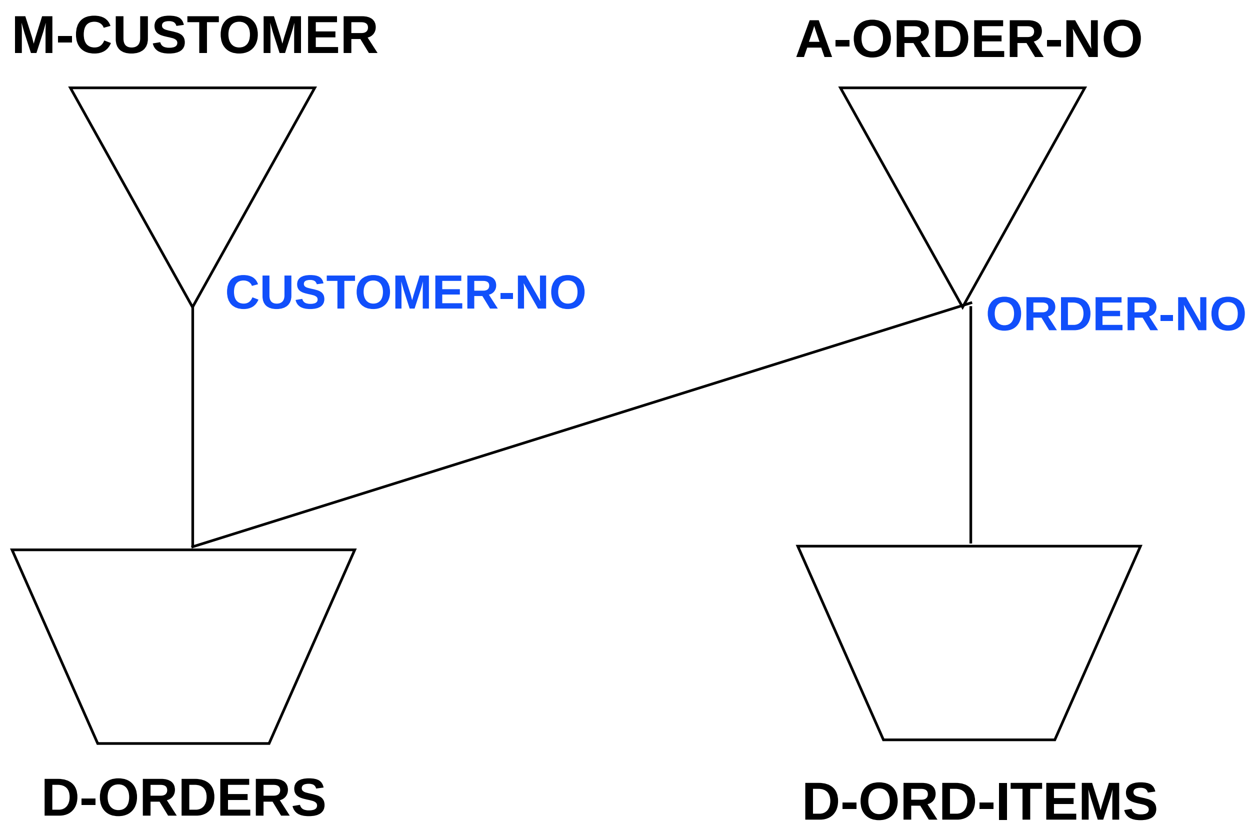


Hashing algorithm (collision - different block)

- Customer number MD4884 collides with AA1000
- No more room in this block. TurboIMAGE reads the following blocks until it finds a free record location.
- In this case, MD4884 is placed two blocks away, which requires two additional I/Os.



An example TurboIMAGE database



HowMessy sample report

```
HowMessy/XL (Version 2.2.1)          Data Base: STORE.DATA.INVENT          Run on: MON, JAN 9, 1995, 11:48 AM
 TurboIMAGE/3000 databases           By Robelle Consulting Ltd.                                        Page: 1

                                                           Secon-  Max
                  Type                              Load   daries  Blks     Blk
     Data Set              Capacity    Entries    Factor  (Highwater)      Fact
  M-Customer       Man       248113     178018     71.7%   30.5% 1496        11
  A-Order-No       Ato      1266783     768556     60.7%   25.7%    1        70
  D-Orders         Det      1000000     768558     76.9%   (   851445)       32
  D-Ord-Items      Det      4000000    3458511     86.5%   (  3470097)       23

                               Max     Ave     Std    Expd      Avg    Ineff   Elong-
         Search Field        Chain   Chain     Dev  Blocks   Blocks     Ptrs    ation
         Customer-No            32    1.92    0.32    1.00     1.90    90.5%     1.90
         Order-No               10    1.35    0.62    1.00     1.00     0.0%     1.00
         !Order-No               1    1.00       0    1.00     1.00     0.0%     1.00
       S Customer-No            80   14.34   17.76    1.75     9.20    57.2%     5.25
       S !Order-No            1604    8.06   35.75    1.36    11.32    72.5%     8.34
```

HowMessy sample report (master dataset)

```
HowMessy/XL (Version 2.2.1)        Data Base: STORE.DATA.INVENT       Run on: MON, JAN 9, 1995, 11:48 AM
 TurboIMAGE/3000 databases         By Robelle Consulting Ltd                                    Page: 1

                                                              Secon- Max
                   Type                                Load   daries  Blks     Blk
     Data Set                Capacity    Entries     Factor  (Highwater)      Fact
  M-Customer         Man       248113     178018      71.7%   30.5% 1496        11
  A-Order-No         Ato      1266783     768556      60.7%    25.7%     1      70
  D-Orders           Det      1000000     768558      76.9%   (    851445)      32
  D-Ord-Items        Det      4000000    3458511      86.5%   (  3470097)       23


                         Max       Ave      Std      Expd       Avg     Ineff    Elong-
      Search Field     Chain     Chain      Dev    Blocks    Blocks      Ptrs     ation
      Customer-No         32      1.92     0.32      1.00      1.90     90.5%      1.90
      Order-No            10      1.35     0.62      1.00      1.00      0.0%      1.00
      !Order-No            1      1.00        0      1.00      1.00      0.0%      1.00
     S Customer-No        80     14.34    17.76      1.75      9.20     57.2%      5.25
     S !Order-No        1604      8.06    35.75      1.36     11.32     72.5%      8.34
```

Interpreting master datasets lines

- Pay attention to the following statistics:
  - High percentage of Secondaries (inefficient hashing)
  - High Maximum Blocks (clustering)
  - High Maximum and Average Chains (inefficient hashing)
  - High Inefficient Pointers (when secondaries exist)
  - High Elongation (when secondaries exist)

Report on m-customer

- The number of Secondaries is not unusually high
- However, there may be problems
  - Records are clustering (high Max Blks)
  - Long synonym chain
  - High percentage of Inefficient Pointers

Data Set	Type	Capacity	Entries	Load Factor	Secon-daries	Max Blks (Highwater)	Blk Fact
M-CUSTOMER	Man	248113	178018	71.7%	<u>30.5%</u>	<u>1496</u>	11

Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
CUSTOMER-NO	<u>22</u>	1.92	0.32	1.00	1.90	<u>90.5%</u>	1.90

Report on a-order-no

- Very tidy dataset
  - Number of Secondaries is acceptable
  - Max Blks, Ineff Ptrs and Elongation are at the minimum values, even if the maximum chain length is a bit high

	Type			Load	Secon-	Max	Blk
Data Set		Capacity	Entries	Factor	daries	Blks (Highwater)	Fact
A-ORDER-NO	Ato	1266783	768556	60.7%	25.7%	1	70

Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
ORDER-NO	10	1.35	0.62	1.00	1.00	0.0%	1.00

Master dataset solutions

- Increase capacity to a higher odd number
- Increase the Blocking Factor
  - Increase block size
  - Reduce record size
- Change binary keys to type X, U, Z, or P
- Check your database early in the design
- Use HowMessy on test databases

HowMessy Exercise 1

Data Set	Type	Capacity	Entries	Load Factor	Secon-Max daries Blks (Highwater)	Blk Fact
A-MASTER	Ato	14505679	9709758	66.9%	36.8% 2395	29

Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
MASTER-KEY	37	1.58	1.26	1.00	1.88	48.5%	1.88

HowMessy sample report (detail dataset)

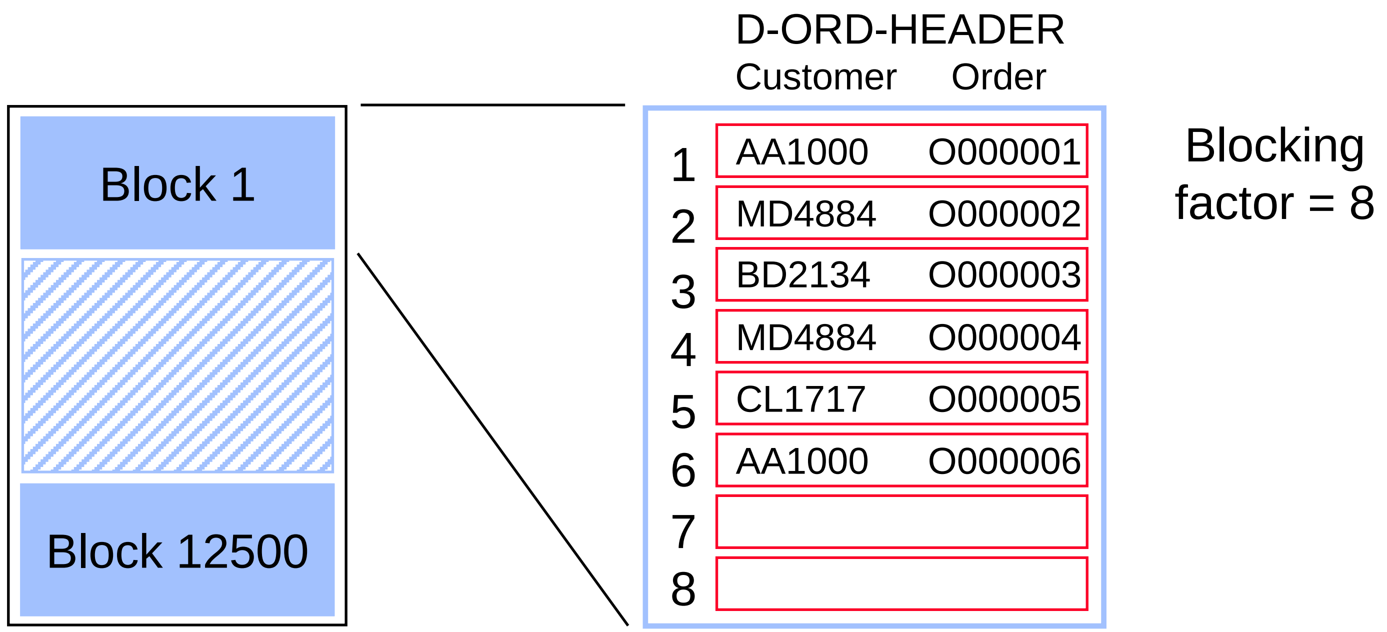
```
HowMessy/XL (Version 2.2.1)          Data Base: STORE.DATA.INVENT        Run on: MON, JAN 9, 1995, 11:48 AM
 for TurboIMAGE/3000 databases        By Robelle Consulting Ltd.                                  Page: 1

                                                    Secon- Max
Type                                          Load daries Blks                Blk
  Data Set                  Capacity   Entries    Factor      (Highwater)    Fact
M-CUSTOMER       Man         248113    178018     71.7%       30.5% 1496        1
A-ORDER-NO       Ato         126673    768556     60.7%       25.7%      1     70
D-ORDERS         Det        1000000    768556     76.9%       (   851445)      12
D-ORD-ITEMS      Det        4000000   3458511     86.5%       (  3470097)      23


                          Max      Ave     Std    Expd       Avg    Ineff   Elong-
          Search Field  Chain    Chain     Dev  Blocks    Blocks     Ptrs    ation
          Customer-No      22     1.92    0.32    1.00      1.90    90.5%     1.90
          Order-No         10     1.35    0.62    1.00      1.00     0.0%     1.00
          !Order-No         1     1.00       0    1.00      1.00     0.0%     1.00
        S Customer-No      80    14.34   17.76    1.75      9.20    57.2%     5.25
        S !Order-No      1604     8.06   35.75    1.36     11.32    72.5%     8.34
```

Empty detail dataset

- Records are stored in the order they are created starting from record 1
- Records for the same customer are linked together using pointers to form a chain
- Chains are linked to the corresponding master entry

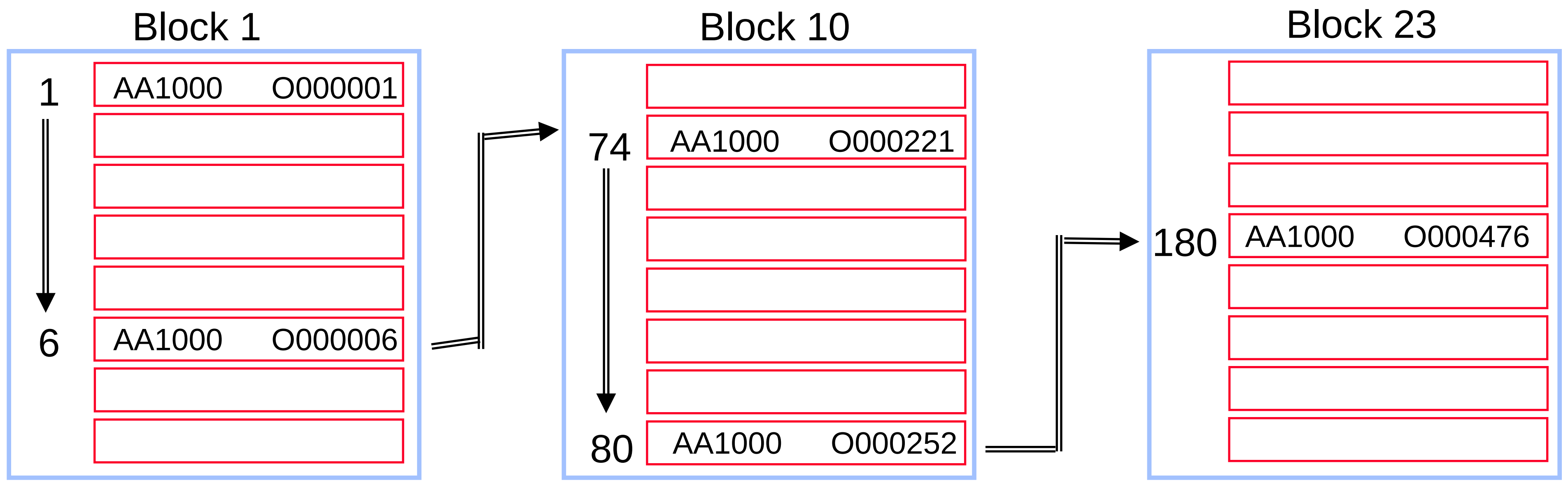


	Customer	Order
1	AA1000	O000001
2	MD4884	O000002
3	BD2134	O000003
4	MD4884	O000004
5	CL1717	O000005
6	AA1000	O000006
7		
8		

Capacity: 100000

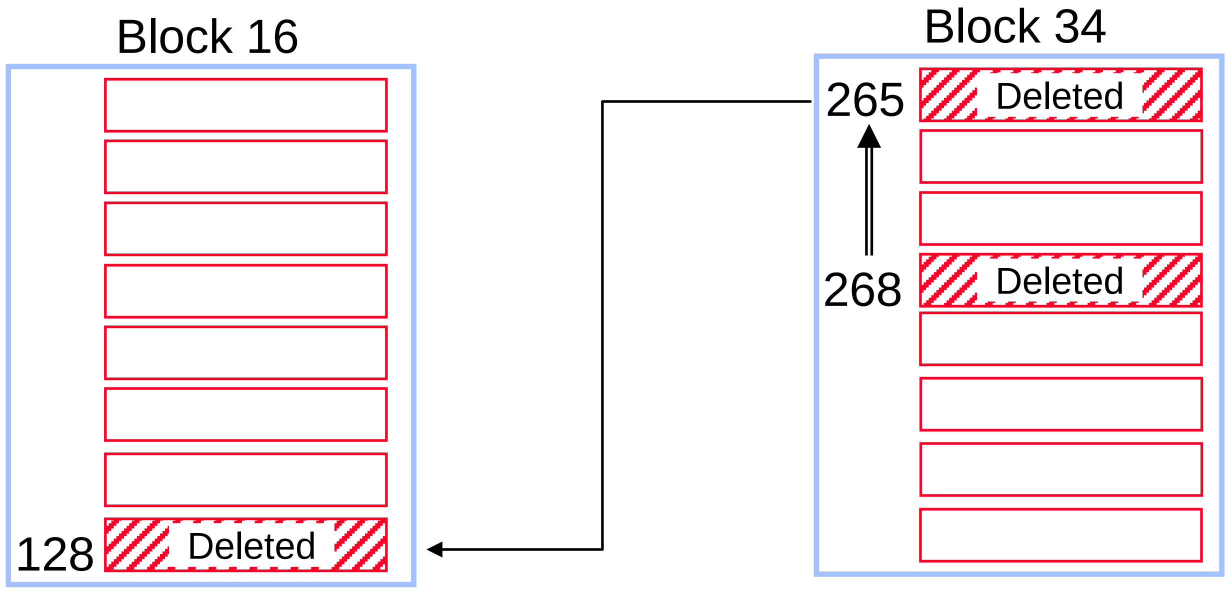
Detail chains get scattered

- Over time, records for the same customer are scattered over multiple blocks



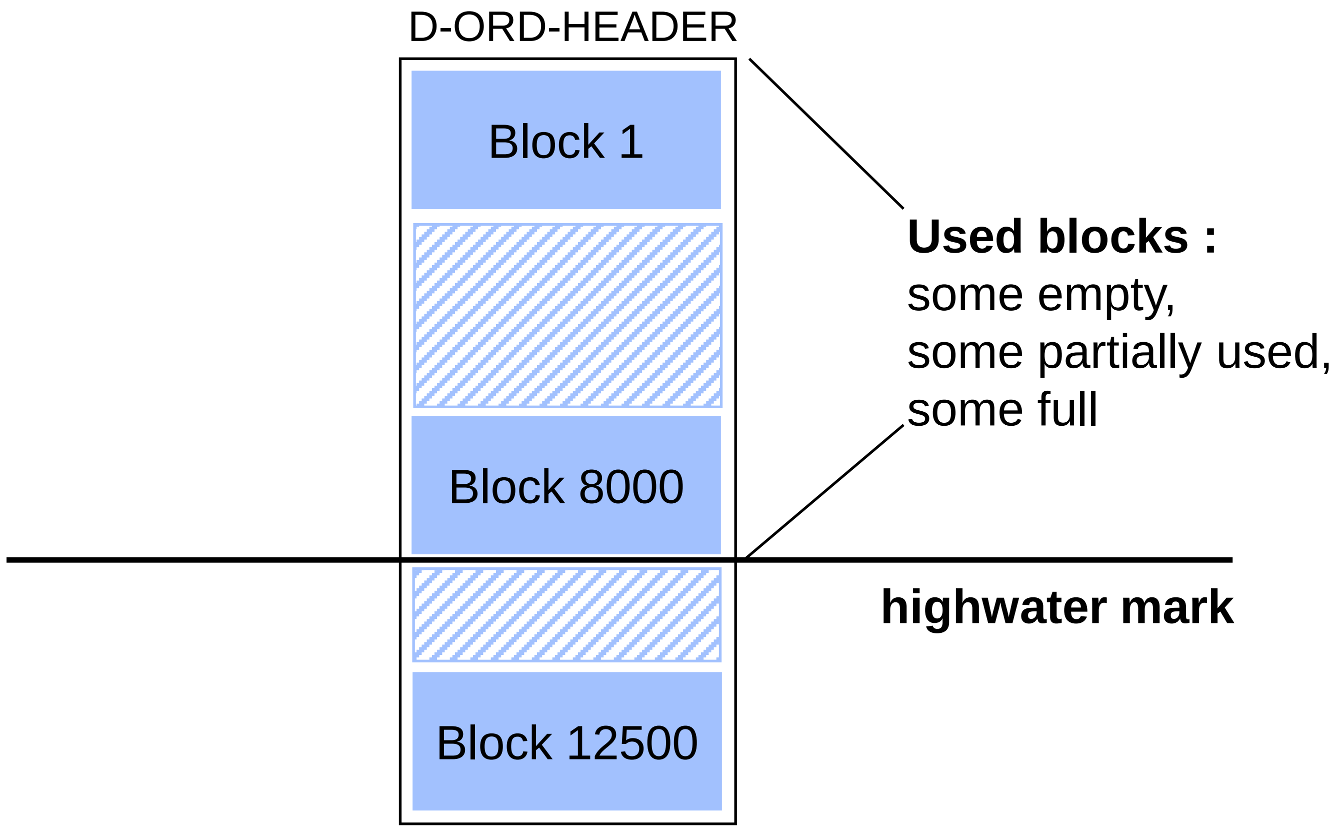
Delete chain

- Deleted records are linked together
- TurboIMAGE reuses the records in the Delete chain, if there are any



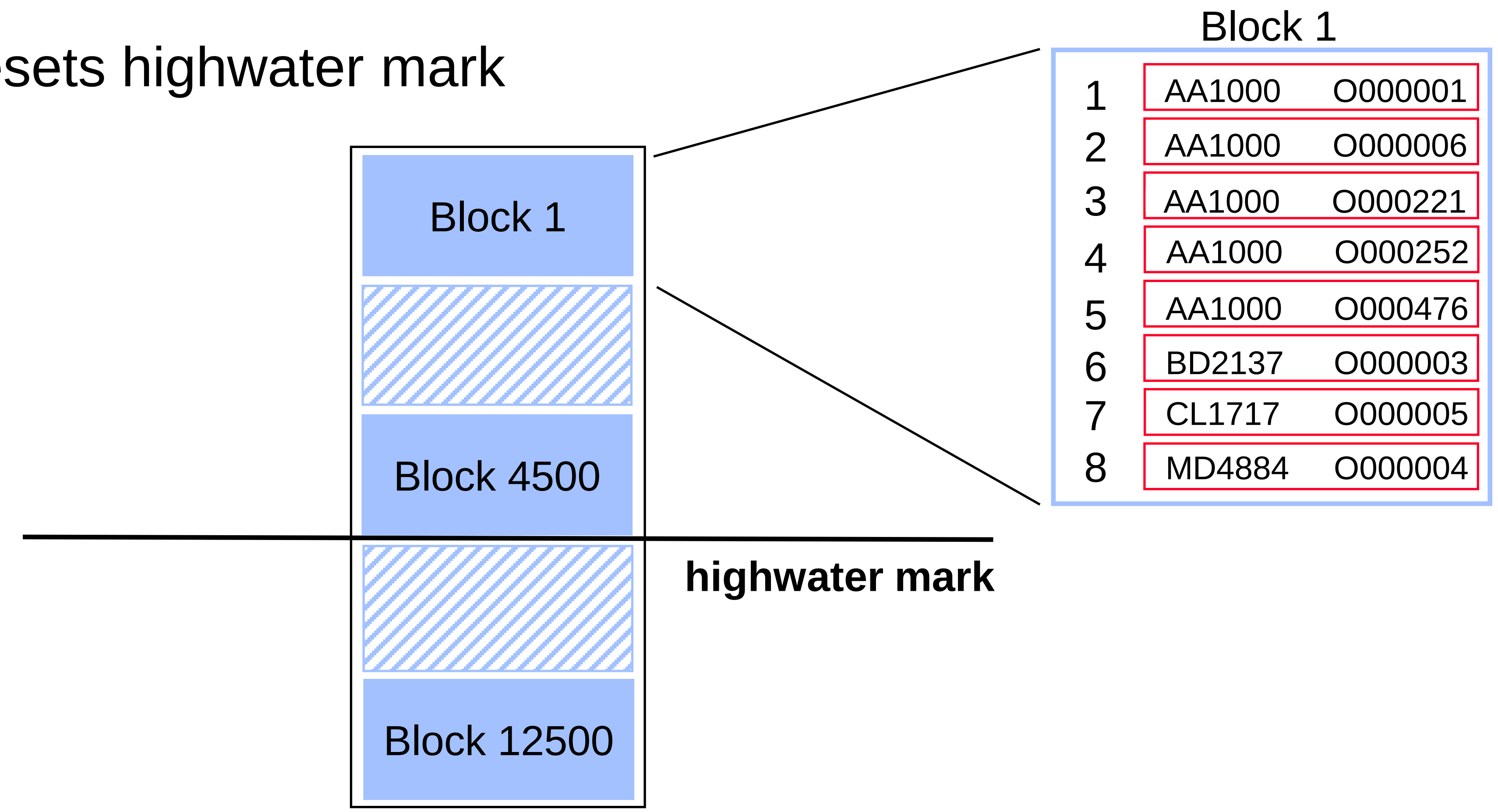
Highwater mark

- Indicates highest record location used so far
- Serial reads scan the dataset up to the highwater mark



Repacking a detail dataset

- Groups records along primary path
- Removes Delete chain (no holes)
- Resets highwater mark



Interpreting detail dataset lines

- Pay attention to the following statistics:
  - Load Factor approaching 100% (dataset full)
  - Primary path (large Average Chain and often accessed)
  - High Average Chain and low Standard deviation, especially with a sorted path (Is path really needed?)
  - High Inefficient Pointers (entries in chain not consecutive)
  - High Elongation (entries in chain not consecutive)

Report on d-orders

- Primary path should be on customer-no, not on order-no
- Highwater mark is high
- Repack along new primary path regularly

Data Set	Type	Capacity	Entries	Load Factor	Secon-daries	Max Blks (Highwater)	Blk Fact
D-ORDERS	Det	1000000	768556	76.9%	(	851445)	12

Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
!ORDER-NO	1	1.00	0	1.00	1.00	0.0%	1.00
S CUSTOMER-NO	80	14.34	17.76	1.75	9.20	57.2%	5.25

Report on d-ord-items

- Inefficient Pointers and Elongation are high
- Highwater mark is fairly high
- Repack the dataset regularly
- Is the sorted path really needed?

Data Set	Type	Capacity	Entries	Load Factor	Secon- daries Max Blks (Highwater)	Blk Fact
D-ORD-ITEMS	Det	4000000	3458511	86.5%	(3470097)	23

Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong- ation
S !ORDER-NO	1604	8.06	35.75	1.36	11.32	72.5	8.34

Detail dataset solutions

- Assign the primary path correctly; search item with Average Chain length > 1 that is accessed most often
- Repack datasets along the primary path regularly
- Increase the Blocking Factor
  - Increase block size
  - Reduce record size
- Understand sorted paths
- Check your databases early in the design; use HowMessy on test databases

HowMessy Exercise 2

Data Set	Type	Capacity	Entries	Load Factor	Secon-daries (Highwater)	Max Blks	Blk Fact
D-ITEMS	Det	620571	119213	19.2%	(	242025)	7

	Search Field	Max Chain	Ave Chain	Std Dev	Expd Blocks	Avg Blocks	Ineff Ptrs	Elong-ation
S !	ITEM-NO	3	1.00	0.02	1.00	1.00	0.0%	1.00
S	SUPPLIER-NO	23	8.07	3.25	1.77	3.30	28.4%	1.86
	LOCATION	5938	11.62	63.64	2.24	2.53	13.2%	1.13
	BO-STATUS	99999	99999.99	0.00	17031.00	17047.00	14.3%	1.00
	DISCOUNT	99999	120.18	1337.15	3.73	39.37	31.9%	10.55

Minimum number of disc I/Os

Intrinsic	**Disc I/Os**	
DBGET	1	
DBFIND	1	
DBBEGIN	1	
DBEND	1	
DBUPDATE	1	(non-critical item)
DBUPDATE	13	(critical item)
DBPUT	3 [+ (4 x #paths, if detail)]	
DBDELETE	2 [+ (4 x #paths, if detail)]	

Serial reads:	
Master	Capacity / Blocking factor
Detail	# entries / Blocking factor

Estimating response time

- Deleting 100,000 records from a detail dataset with two paths would take:
    - 2 + (4 x 2 paths) = 10 I/Os per record
    - 100,000 records x 10 I/Os per record = 1,000,000 I/Os
- Classic: around 25 I/Os per second
    - 1,000,000 I/Os / 25 = 40,000 seconds
    - 40,000 seconds / 3600 = 11.1 hours
- iX: around 40 I/Os per second
    - 1,000,000 I/Os / 40 = 25,000 seconds
    - 25,000 seconds / 3600 = 6.9 hours

Automating HowMessy analysis

- Recent version of HowMessy creates a self-describing file with these statistics
- Process the file with generic tools (Suprtool, AskPlus) or custom programs (COBOL, 4GL), and produce custom reports
- Send messages to database administrators
- Write "smart" job to fix databases without user intervention

Processing Loadfile with Suprtool

- Datasets more than 80% full

```
>input    loadfile
>if loadfactor > 80
>ext database, dataset, datasettype, loadfactor
>list standard
```

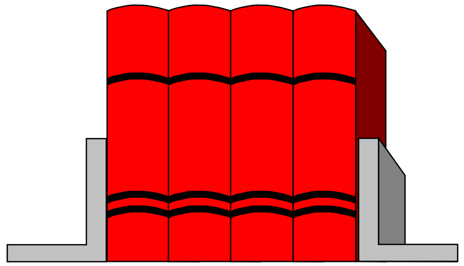
- Only one address per customer

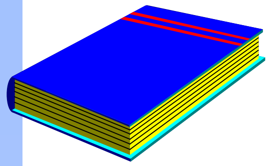
```
>input    loadfile
>if  dataset = "D-ADDRESSES" and &
     maxchain > 1
```

References

- The TurboIMAGE/3000 Handbook (Chapter 23)
- Available for $ 49.95 from:

  WORDWARE
  P.O. Box 14300
  Seattle, WA 98114





Summary

- TurboIMAGE databases become messy over time, especially if they are active
- HowMessy and DBLOADNG let you analyze the database’s efficiency
- You should have some knowledge of the internal workings of TurboIMAGE
- Monitor your databases regularly

PowerHouse and Suprtool

PowerHouse and Suprtool

Why preselect data with Suprtool?

- Suprtool features
  - Fast and efficient serial reads of files
  - Powerful and flexible selection features
  - Efficient sort routines
  - Links files on any field with minimum disc I/O
  - Interfaces with many application tools

- QUIZ features
  - Powerful, flexible report writer
  - Uses standard data retrieval methods

Reading input files

- Suprtool can read
  - IMAGE datasets
  - KSAM files
  - MPE disc files
  - Tape files
  - Other files with fixed-length records
- QUIZ can read
  - QDD or PDL declared files
  - PowerHouse subfiles
- MPE disc files can be declared in the PowerHouse dictionary

A typical QUIZ and Suprtool task

- Choose an input method for QUIZ; Suprtool cannot create subfiles
  1. Create an empty subfile

     or

  2. Describe a direct or sequential file in PDL or QDD

- Use Suprtool to populate the file

- Access the output file in QUIZ and link to others

Step 1: Creating subfiles

- QUIZ

```
>access D-SALES
>report summary all
>set subfile name SALESUB keep size 10000
>set report limit 1
>go
```

- QTP

```
>access D-SALES
>subfile SALESUB keep size 10000 include D-SALES
>set input limit 0
>go
```

- Different results if items redefined more than once

Step 2: Populate the subfile with Suprtool

```
:run SUPRTOOL.PUB.ROBELLE

>base STORE,5,READER
>get D-SALES
>if PRODUCT="WIDGET"
>sort CUST-ACCOUNT
>output SALESUB,erase
>xeq
IN=20, OUT=6. CPU-Sec=1. Wall-Sec=1.
```

Step 3: QUIZ can now read the subfile

- Change the QUIZ report from

```
>access D-SALES
>select if PRODUCT="WIDGET"
>sort on CUST-ACCOUNT
>Heading ...
```

to

```
>access *SALESUB
>sorted on CUST-ACCOUNT
>Heading ...
```

- QUIZ TIP: Compiled QUIZ program doesn't require mini-dictionary

Linking multiple data files

Using Suprlink with PowerHouse

- Suprtool reads and selects records from each data file
- Suprtool sorts the qualified records on the link field into flat files
- Suprlink links the files into one record and writes to the subfile
- QUIZ does the final reporting

Linking with QUIZ versus Suprlink

- QUIZ
    - Links on key fields
    - One-to-many links
    - Link field appears twice in subfile
- Suprlink
    - Links flat files on any sorted field
    - Each input file record can generate only one output record
    - Link field appears once in output record

Linking with Suprlink versus QUIZ

M-CUSTOMER File

CUST-ACCO	NAME-FIRST	NAME-LAST
10001	Darlene	Hamilton
10002	Gordon	Lackner
10003	John	Melander
10008	Thomas	Serafin
10009	Gordon	Oxenbury
10010	Wayne	Humphreys
10011	William	Kirk
10012	Percy	Ferguson
10013	Colin	Andersen
10019	Rupert	Hillstrom
10020	Walley	Nisbet

D-SALES File

PURCH-DATE	CUST-ACCO
19931015	10003
19931015	10003
19931015	10003
19931020	10010
19931021	10016
19931021	10016
19931001	10020
19931028	10020

- QUIZ links 6 records; 14 records if optional link

```
CUST-ACCOUNT NAME-FIRST NAME-LAST PURCH-DATE CUST-ACCOUNT
```

- Suprlink links 3 records; 11 records if optional link

```
CUST-ACCOUNT NAME-FIRST NAME-LAST PURCH-DATE
```

Replacing QUIZ with Suprlink

- Change one-to-many links to many-to-one; output file cannot contain more records than input file
- Field sequence is different from QUIZ output
- Link field is not repeated in output record; record length of Suprlink output file is smaller than QUIZ
- Optional linkage defaults fields to blanks or zeros

Debugging tip

- First create a self-describing (SD) file with the LINK option

```
>output SALCUST,LINK
```

- Use FORM command to examine record structure

```
>form salcust
File: SALCUST.HANS.TECHSUP          (SD Version B.00.00)
Entry:                           Offset
   CUST-ACCOUNT          Z8         1    <<Sort 1 >>
   DELIV-DATE            I2         9
   PRODUCT-NO            Z8         13
   PRODUCT-PRICE         I2         21
   PURCH-DATE            I2         25
   ...
   POSTAL-CODE           X6         135
Limit: 108 EOF: 8 Entry Length: 140 Blocking: 29
```

Creating subfiles from multiple datasets

- Indexed link

QUIZ

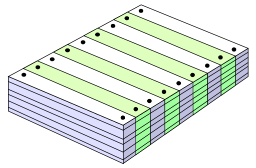
```
>Access D-SALES link to M-CUSTOMER
>report summary CUST-ACCOUNT NAME-FIRST &
>     NAME-LAST PURCH-DATE
>set subfile name ...
```

QTP

```
>Access D-SALES link to M-CUSTOMER
>subfile SALFILE size 10000 keep &
>     include D-SALES, NAME-FIRST, NAME-LAST
>set input limit 0
>go
```

- Suprlink does not repeat link field in output record

Creating complex subfiles without an indexed link



- Suprlink can link files on any field
- QUIZ requires an index to link
- How do you create a QUIZ subfile with the required fields?
- Two steps:
  1. Build a one-record subfile of each data file
  2. Link subfiles on record number to create new subfile

```
>Access *SALSUB link to record(0) of *CUSTSUB
>report summary CUST-ACCOUNT NAME-FIRST ...
```

- Subfiles must have correct item definitions; data not important

Creating subfiles without a PowerHouse dictionary

- Create a one-record subfile with QUIZ

```
>define NAME-FIRST character size 10 = " "
>define NAME-LAST character size 20 = " "
>define DELIV-DATE Integer size 4 = 0
>report summary all
>set subfile name ...
```

- Ensure data-types match actual data
  - **`Integer*4`** is not the same as **`Integer size 4`**
  - Check record length of subfile against data

Creating new data fields

- Suprtool can summarize at sort breaks

```
>duplicate none keys total Sales-total
```

- Suprtool creates new fields for totals
  - Field names ST-TOTAL-1, ST-TOTAL-2, etc.
  - Appended to record
  - Field format P28 (packed-decimal)
- To create a compatible field in QUIZ:

```
>define D-Total packed size 14 = 0
```

A typical requirement: Summary values

- Create subfile with sort and total fields
- Calculate sort-break totals with Suprtool

```
>get d-sales
>sort cust-account
>dup none keys total sales-total
>extract cust-account
>out saltot,erase
```

- Use totals in QUIZ report

```
>access *saltot link to d-sales
>define d-pcnt num*3 = &
                  (sales-total/st-total-1)*100
>report .....
```

Summary of Speeding Up QUIZ

- Suprtool delivers qualified data to QUIZ
- Data must be in a format QUIZ understands
- Use PowerHouse to create its own data structures
- Create new items with QUIZ Define commands
- Use Suprtool FORM command to examine structure
- Use Show Items in QUIZ to display structure

Carefully examine your requirements

Call our toll-free number if you need help

Speed Demon

Working with Speed Demon

What is Speed Demon?

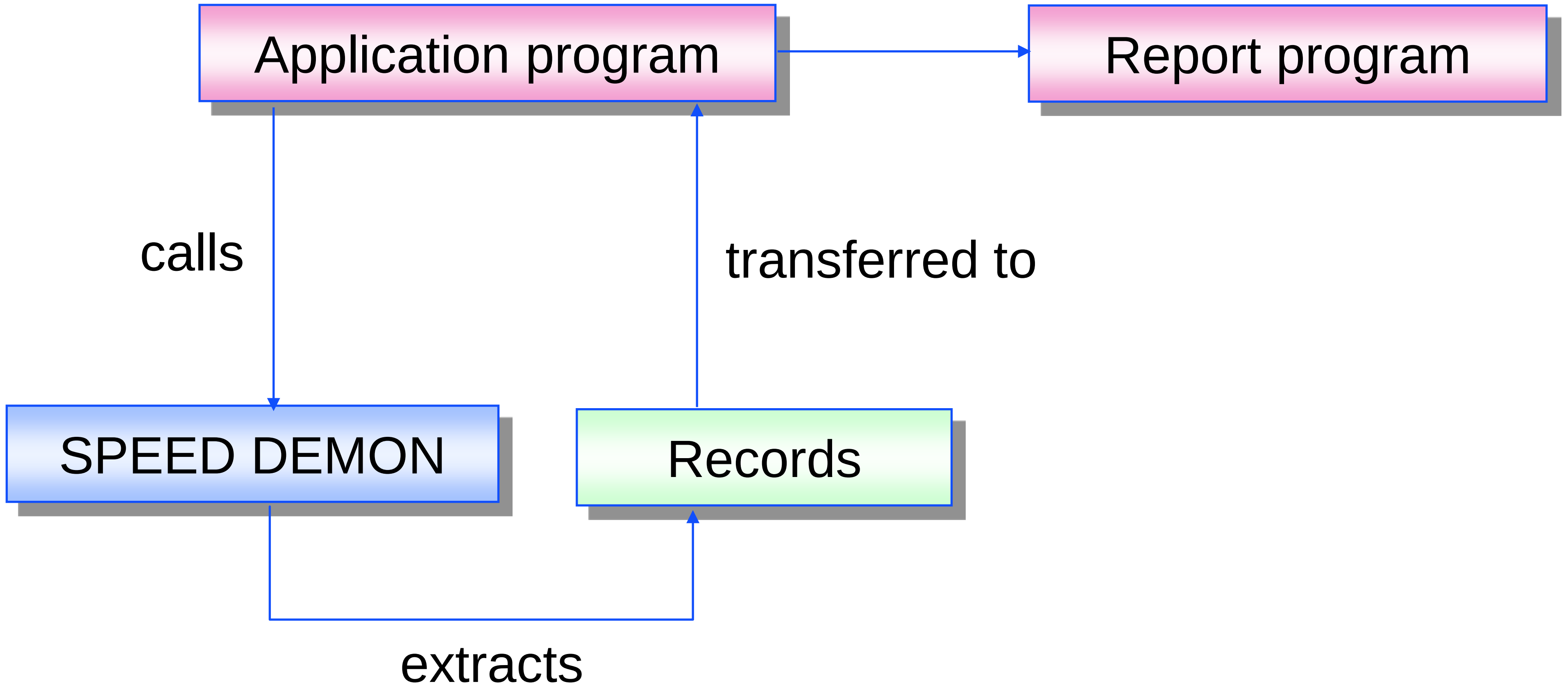
Speed Demon

- Reads records sequentially
- Same as serial DBGET for user programs
- Useful when you want to extract more than 50% of a dataset
- Works best in 3G languages, such as COBOL, Pascal and FORTRAN

Comparing Speed Demon and Suprtool

- Suprtool is a stand-alone utility program
    - Selects, sorts, and extracts records
    - Puts extracted records in an output file
    - Output is available to application programs for further processing
- Speed Demon is an intrinsic library
    - Extracts records
    - Cannot select or sort records
    - Moves extracted records directly to the application program

Extracting records



Versions of Speed Demon

- Compatibility mode (CM) version on MPE V
  - Faster than DBGET
  - Slower than Suprtool
  - Uses a small amount of stack space
- Native mode (NM) version on MPE/iX
  - Faster than DBGET
  - As fast as Suprtool

Speed Demon intrinsics

- SPDEDBINIT selects dataset and field list
- SPDEDBSCAN replaces calls to DBGET mode-2
- SPDEDBSHUT cleans up after dataset scan
- SPDEEXPLAIN prints error messages

SPDEDBSCAN replaces DBGET mode-2

SPDEDBSCAN intrinsic

- Has similar parameters to DBGET, but without NO SET, MODE or LIST options
- Must call SPDEDBINIT before SET and LIST
- Mode-2 serial access is always assumed

SPDEDBINIT selects dataset and field list

SPDEDBINIT intrinsic

- Mode-1 returns the entire record
- Mode-2 allows you to specify a list of field names
- Required before each SPDEDBSCAN
- Scans only one dataset at a time
- Requires database opened with DBOPEN command

SPDEDBINIT in mode-1 returns complete record

```
Call "SPDEDBINIT" using db-base
                        db-set-d-sales
                        db-mode-1
                        db-status-area
                        spde-db-control
                        db-dummy-arg.


01 spde-db-control.
   05 spde-db-version     pic s9(4) comp value 0.
   05 spde-db-buffer      pic s9(4) comp value zeroes.
   05 spde-filler         pic x(20) value spaces.
```

SPDEDBINIT in mode-2 returns specific fields

- Speed Demon accepts all valid TurboIMAGE field lists except “*” list

-
  ```
  Move "CUST-ACCOUNT,PRODUCT-NO, PRODUCT-PRICE;"
  to db-list-d-sales.
  ```

-
  ```
  Call "SPDEDBINIT" using db-base
                          db-set-d-sales
                          db-mode-2
                          db-status-area
                          spde-db-control
                          db-list-d-sales.
  ```

SPDEDBSHUT cleans up after DBSCAN

SPDEDBSHUT intrinsic

- Mode-1 closes the database
- Mode-2 closes the database and prints a performance report
- If omitted, will cause next SPDEDBINIT to fail
- **Call "SPDEDBSHUT" using db-base**

```
Call "SPDEDBSHUT" using db-base
                        db-set-d-sales
                        db-mode-1
                        db-status-area
                        spde-db-control
                        db-dummy-arg.
```

Summary

- Replacement for DBGET mode-2
- Intrinsics