IBM® TS7700 Series
Tape Tools
VEHSTATS user manual

Version 1.2

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Introduction

This document is intended for owners and users of the TS7700 Virtualization Engine for evaluating performance and analyzing trends based on historical statistics of the TS7700. The document contains information about the VEHSTATS program, its management parameters and the logic of its operation.

To understand the contents of this document, you need to have the skills in Job Control Language of z / OS and familiarity with the document **"TS7700 Series Statistical Data Format White Paper"**

This document contains only general information about the reports created by the VEHSTATS program. The detailed descriptions of them are contained in the document **"TS7700 Series VEHSTATS Decoder"**.

Change history

Version No.	Date	Description
1.0	December 15th, 2017	Initial version
1.1	May 05th, 2018	The table that describes the dataset DD statements and the table that describe the error and warning messages are actualised. The example of the new version of the protocol SYSLIST is added to the Appendix C. The detected mistypes and errors are corrected.
1.2	December 28th, 2020	Changes to reflect functionality of the program related to the microcode release 5.1. Some error corrections done.

Overview

The VEHSTATS program is designed to create reports based on historical statistics generated as the result of the "HISTORICAL STATISTICS" BVIR request. VEHSTATS runs only in z/OS. The program VEHSTATS calls SORT utility dynamically.

Installation process

The TAPETOOL package should be installed before running the VEHSTATS program. The installation process is described in the file ibmtools.txt on the FTP.

After installation, several libraries will be created including the libraries xxx. IBMTOOLS.LOAD and xxx.IBMTOOLS.JCL.

Versions of the program

Not any version of VEHSTATS is able to process **any** historical data correctly. See the table below with the instructions which version of VEHSTATS should be used.

#	Microcode level	Program	recommendation
1.	8.051.xxx.xxxx	VEHSTATS	not earlier than 20344-05.37
		VEHSCAN	not earlier than 20212-10.47
2.	8.050.xxx.xxxx	VEHSTATS	not earlier than 19333-09.35
		VEHSCAN	not earlier than 19268-02.15
3	8.042.xxx.xxxx	VEHSTATS	not earlier than 19071-15.15
		VEHSCAN	not earlier than 18023-08.33
4	8.041.xxx.xxxx 8.040.xxx.xxxx 8.03x.xxx.xxxx 8.02x.xxx.xxxx 8.01x.xxx.xxxx	VEHSTATS VEHSCAN	the program version must be built later than the date of the microcode release

For now, the latest version of VEHSTATS correctly processes historical data of old microcode releases.

Kind of reports

There are 2 kinds of reports generated by VEHSTATS:

- reports with fixed layouts;
- **order-based** or summary reports – reports with user-defined layouts.

The order-based reports are COMPARE, DAYSMRY, DAYHSMRY, HOURFLAT, MONSMRY, MNTHSMRY and WEKHSMRY. The rest of the reports are reports with fixed layouts.

There are 2 groups of order based reports – **vertical** and **horizontal**.
In vertical order based reports fields with same statistics are collected in lines for different periods or clusters. COMPARE, DAYSMRY and MONSMRY are vertical order based reports.
In horizontal order based reports every detail line contains several statistic values for a period or a cluster. DAYHSMRY, HOURFLAT, MNTHSMRY, WEKHSMRY are horizontal order based reports.

Running VEHSTATS program

Jobs from the installation package

There are 3 typical jobs for running the program in the library xxx.IBMTOOLS.JCL:

- VEHSTSO – writes reports directly to SYSOUT;
- VEHSTPS – writes reports to a single physical sequential file;
- VEHSTPO – writes reports to a library where each report is a separate member of the library.

In addition, there are templates of the jobs to get historical statistics to prepare the input file for VEHSTATS:

- BVIRHSTU – extracts historical statistic data to sequential file with RECFM=U;
- BVIRHSTV – extracts historical statistic data to sequential file with RECFM=V;
- BVIRHSTS – extracts historical statistic data and direct it to SMF (obsolete).

The dataset list

The table below contains the list of DD statements for the program VEHSTATS.

Some reports may be created empty if the input historical statistical data does not contain the info required for the reports. If an optional DD statement is not specified then the corresponding report is not created.

No.	DD name	Mandatory or Optional	Dataset type	Description
1	SYSCNTL	mandatory	input	Sequential data set with LRECL=80 that contains the list of control parameters.
2	STATSU	At least 1 is mandatory	input	Sequential data set with RECFM=U or RECFM=VB that contains historical statistical records to be processed.
3	STATSVB		input	
4	STATSMF		input	Sequential data set with unloaded SMF records. Only records with historical statistics are processed
5	SORTIN	mandatory	working	Sequential data sets that are used as an interface with the utility **SORT**.
6	SORTOUT	mandatory	working	
7	SORTWK01 SORTWK02 SORTWK03 SORTWK04 SORTWK05 SORTWK06 SORTWK07	optional	working	Working datasets for the utility **SORT**.
8	SYSLIST	mandatory*	output	Defines the data set in which the program **COMPARSE** (that is called by **VEHSTAST**) prints control statements and their error messages. * - this DD statement may be not specified if COMPARSE version 18104-08.54 and later is used. The program VEHSTATS will finished OK if this DD is not specified and there are no parsed errors detected. Otherwise, the DD should be specified to see the protocol to fix errors.
9	SYSOUT	mandatory	output	Defines the data set in which **SORT** messages and control statements are output.
10	RECLIST	optional	output	Defines the data set in which detail list of historical statistical record time stamps, information about duplicated records and some information and error messages are output.
11	AVGRDST	optional	output	Defines the data set in which the report **AVGRDST** lines are output.
12	COMPARE	optional	output	Defines the data set in which the lines of the report **COMPARE** are output. Created if the parameter REPORT=COMPARE is specified.
13	DAYSMRY	optional	output	Defines the data set in which the lines of the report **DAYSMRY** are output.
14	DAYHSMRY	optional	output	Defines the data set in which the lines of the report **DAYHSMRY** are output. Created if the parameter REPORT=HDSUM is specified.
15	DAYHSCL0 DAYHSCL1 DAYHSCL2 DAYHSCL3 DAYHSCL4 DAYHSCL5 DAYHSCL6 DAYHSCL7	optional	output	Defines the data sets in which the lines of the reports **DAYHCL*n*** are output. Created if parameters REPORT=HDSUM and SPLITCLUSTERS is ON. Every report **DAYHCL*n*** contains the lines related to a cluster with corresponding number.
16	DAYXFER	optional	output	Defines the data set in which the lines of the report **DAYXFER** are output. Created if the parameter REPORT=DXFR is specified.
17	HOURFLOW	optional	output	Defines the data set in which the lines of the report **HOURFLOW** are output. Created if the parameter REPORT=FLOW is specified.

No.	DD name	Mandatory or Optional	Dataset type	Description
18	HOURXFER	optional	output	Defines the data set in which the lines of the report **HOURXFER** are output. Created if the parameter REPORT=HXFR is specified.
19	H20VIRT	optional	output	Defines the data set in which the lines of the report **H20VIRT** are output.
20	H21ADP00	optional	output	Defines the data sets in which the lines of the report **H21ADP00** are output. The report contains the information related to adaptor 0.
21	H21ADP01	optional	output	Defines the data sets in which the lines of the report **H21ADP01** are output. The report contains the information related to adaptor 1.
22	H21ADP02	optional	output	Defines the data sets in which the lines of the report **H21ADP02** are output. The report contains the information related to adaptor 2.
23	H21ADP03	optional	output	Defines the data sets in which the lines of the report **H21ADP03** are output. The report contains the information related to adaptor 3.
24	H21ADPXX	optional	output	Defines the data set in which the lines of the report **H21ADPXX** are output.
25	H21ADPSU	optional	output	Defines the data set in which the lines of the report **H21ADPSU** are output.
26	H30TVC1	optional	output	Defines the data set in which the lines of the report **H30TVC1** are output. The report contains the information related to cache partition 0.
27	H30TVC2	optional	output	Defines the data set in which the lines of the report **H30TVC2** are output. The report contains the information related to cache partition 1 if any or the report is empty.
28	H30TVC3	optional	output	Defines the data set in which the lines of the report **H30TVC3** are output. The report contains the information related to cache partition 2 if any or the report is empty.
29	H30TVC4	optional	output	Defines the data set in which the lines of the report **H30TVC4** are output. The report contains the information related to cache partition 3 if any or the report is empty.
30	H30TVC5	optional	output	Defines the data set in which the lines of the report **H30TVC5** are output. The report contains the information related to cache partition 4 if any or the report is empty.
31	H30TVC6	optional	output	Defines the data set in which the lines of the report **H30TVC6** are output. The report contains the information related to cache partition 5 if any or the report is empty.
32	H30TVC7	optional	output	Defines the data set in which the lines of the report **H30TVC7** are output. The report contains the information related to cache partition 6 if any or the report is empty.
33	H30TVC8	optional	output	Defines the data set in which the lines of the report **H30TVC8** are output. The report contains the information related to cache partition 7 if any or the report is empty.
34	H30COMP	optional	output	Defines the data set in which the lines of the report **H30COMP** are output.
35	H31IMEX	optional	output	Defines the data set in which the lines of the report **H31IMEX** are output.
36	H32TDU12	optional	output	Defines the data set in which the lines of the report **H32TDU12** are output. The report contains the information about physical drive of types 0 and 1.
37	H32TDU34	optional	output	Defines the data set in which the lines of the report **H32TDU34** are output. The report contains the information about physical drives of types 3 and 4 if any or the report is empty.
38	H32PD01 H32PD02 H32PD03 H32PD04	optional	output	Defines the data sets in which the lines of the reports **H32PD01** – **04** are output. For now, these reports created empty.

No.	DD name	Mandatory or Optional	Dataset type	Description
39	H32CSP	optional	output	Defines the data set in which the lines of the report **H32CSP** are output.
40	H32GUP01	optional	output	Defines the data set in which the lines of the report **H32GUP01** are output. The report contains the information about POOLs 01 and 02 if any or the report is empty.
41	H32GUP03	optional	output	Defines the data set in which the lines of the report **H32GUP03** are output. The report contains the information about POOLs 03 and 04 if any or the report is empty.
42	H32GUP05	optional	output	Defines the data set in which the lines of the report **H32GUP05** are output. The report contains the information about POOLs 05 and 06 if any or the report is empty.
43	H32GUP07	optional	output	Defines the data set in which the lines of the report **H32GUP07** are output. The report contains the information about POOLs 07 and 08 if any or the report is empty.
44	H32GUP09	optional	output	Defines the data set in which the lines of the report **H32GUP09** are output. The report contains the information about POOLs 09 and 10 if any or the report is empty.
45	H32GUP11	optional	output	Defines the data set in which the lines of the report **H32GUP11** are output. The report contains the information about POOLs 11 and 12 if any or the report is empty.
46	H32GUP13	optional	output	Defines the data set in which the lines of the report **H32GUP13** are output. The report contains the information about POOLs 13 and 14 if any or the report is empty.
47	H32GUP15	optional	output	Defines the data set in which the lines of the report **H32GUP15** are output. The report contains the information about POOLs 15 and 16 if any or the report is empty.
48	H32GUP17	optional	output	Defines the data set in which the lines of the report **H32GUP17** are output. The report contains the information about POOLs 17 and 18 if any or the report is empty.
49	H32GUP19	optional	output	Defines the data set in which the lines of the report **H32GUP19** are output. The report contains the information about POOLs 19 and 20 if any or the report is empty.
50	H32GUP21	optional	output	Defines the data set in which the lines of the report **H32GUP21** are output. The report contains the information about POOLs 21 and 22 if any or the report is empty.
51	H32GUP23	optional	output	Defines the data set in which the lines of the report **H32GUP23** are output. The report contains the information about POOLs 23 and 24 if any or the report is empty.
52	H32GUP25	optional	output	Defines the data set in which the lines of the report **H32GUP25** are output. The report contains the information about POOLs 25 and 26 if any or the report is empty.
53	H32GUP27	optional	output	Defines the data set in which the lines of the report **H32GUP27** are output. The report contains the information about POOLs 27 and 28 if any or the report is empty.
54	H32GUP29	optional	output	Defines the data set in which the lines of the report **H32GUP29** are output. The report contains the information about POOLs 29 and 30 if any or the report is empty.
55	H32GUP31	optional	output	Defines the data set in which the lines of the report **H32GUP31** are output. The report contains the information about POOLs 31 and 32 if any or the report is empty.
56	H35CLOCL	optional	output	Defines the data set in which the lines of the report **H35CLOCL** are output
57	H35CLOID	optional	output	Defines the data set in which the lines of the report **H35CLOID** are output
58	H33GRID	optional	output	Defines the data set in which the lines of the report **H33GRID** are output.
59	HOURFLAT	optional	output	Defines the data set in which the lines of the report **HOURFLAT** are output.

No.	DD name	Mandatory or Optional	Dataset type	Description
60	HOURFCL0 HOURFCL1 HOURFCL2 HOURFCL3 HOURFCL4 HOURFCL5 HOURFCL6 HOURFCL7	optional	output	Defines the data sets in which the lines of the reports **HOURFCL*n*** are output. Created if option SPLITCLUSTERS is ON. Every report **HOURFCL*n*** contains the lines related to a cluster with the corresponding number.
61	MONSMRY	optional	output	Defines the data set in which the lines of the report **MONSMRY** are output.
62	MNTHSMRY	optional	output	Defines the data set in which the lines of the report **MNTHSMRY** are output.
63	MNTHSCL0 MNTHSCL1 MNTHSCL2 MNTHSCL3 MNTHSCL4 MNTHSCL5 MNTHSCL6 MNTHSCL7	optional	output	Defines the data sets in which the lines of the reports **MNTHSCL*n*** are output. Created if option SPLITCLUSTERS is ON. Every report **MNTHSCL*n*** contains the lines related to a cluster with the corresponding number.
64	WEKHSMRY	optional	output	Defines the data set in which the lines of the report **WEKHSMRY** are output.
65	WEKHSCL0 WEKHSCL1 WEKHSCL2 WEKHSCL3 WEKHSCL4 WEKHSCL5 WEKHSCL6 WEKHSCL7	optional	output	Defines the data sets in which the lines of the reports **WEKHSCL*n*** are output. Created if option SPLITCLUSTERS is ON. Every report **WEKHSCL*n*** contains the lines related to a cluster with the corresponding number.

Licence validation logic

Before running any Tape Tools program, the licence validation is performed. To pass the licence check the statement **EXPIRE** must be specified in the **SYSCNTL** input file:

EXPIRE=***ddMONyear <key>;***

where ***ddMONyear*** is the expiration date and ***<key>*** is a control sum that matches the expiration date. The program developer provides these values.

If **EXPIRE** statement is not specified or the expiration date is less than the current date or the key value does not match the expiration date then the program running is interrupted and the message about the situation is issued into the dataset **SYSLIST**.
If the control sum matches the expiration date and the current date is less than the expiration date not more than 30 days then the warning message is issued into the dataset **SYSLIST**.
The use of the licence validation logic is just a way of ensuring that users stay relatively current with their **IBMTOOLS** libraries. Review the file **updates.txt** on the **ftp site** to see what program changes have been made since you last downloaded.
The latest expiration date and the corresponding key may be found in the member **EXPIRE** of the xxx.**IBMTOOLS.jcl** library.

ORDER statements

The ORDER statements determine which fields will be reported in the order-based reports and what order they will appear in. There are two kind of the **ORDER** statements: the **ORDERs** with **SECTION** keyword and the other **ORDERs** that determine the fields with statistics. The second kind of the ORDERs are described in the document **"TS7700 Series VEHSTATS Decoder".**
The **ORDERs** with **SECTION** determine the headers of the groups of detailed lines in vertical order-based reports and do not affect the content of horizontal order based reports.

```
 ORDER='    CODE LEVEL';   MICRO CODE LEVEL AT END OF INTERVAL (DA/MO)
 ORDER='DAYS W/ACTIVTY';   NUM DAYS WITH ACTIVITY FOR MONSMRY
 ORDER='    UTC OFFSET';   UTC OFFSET VALUE SPECIFIED
*
 ORDER='SECTION:               ';           SECTION HEADING
 ORDER='SECTION:TS7700 CAPACITY';           SECTION HEADING
 ORDER='      TVC SIZE';  TOTAL TVC SIZE AVAILABLE
 ORDER='  ACTIVE LVOLS';  TOTAL ACTIVE LOGICAL VOLUMES
 ORDER='    ACTIVE GBS';  TOTAL ACTIVE GB OF DATA
```

```
 ORDER='SECTION:               ';           SECTION HEADING
 ORDER='SECTION:GRID COPY PERFORMANCE';     SECTION HEADING
 ORDER='SECTION:CLUSTER 0 COPIES   ';       SECTION HEADING
```

There are the following pre-gathered up ORDERs lists in the library xxx.**IBMTOOLS.jcl** from the installation package:

#	member name	comments
1.	ORDERALL	contains all ORDERs that supported by VEHSTATS. Not all ORDERs are active – the list should be customized before usage.
2.	ORDERV12	it is a default ORDERs list and is designed for grids that have up to 4 clusters - CL0 - CL3 and usually is used for creation the reports for the VEHSTATS_MODEL.XLS spreadsheet.
3.	ORDERC25	designed for grids that have up to 4 clusters – CL2 - CL5 and usually is used for creation the reports for the VEHSTATS_MODEL.XLS spreadsheet.
4.	ORDERKLY	designed for grids with up to 6 clusters – CL0 – CL5 to show amounts of data exchange between each pair of the clusters and throughput of the exchange.
5.	ORDERPTT	designed to show information about all cache partitions and combines data from all reports H30TVCx in one reports.
6.	ORDERXFR	designed to show transfer activities of clusters.
7.	ORDER6CL	designed for grids with up to 6 clusters – CL0 – CL5. Usually is used to generate the reports for loading into TECHDOC Excel spreadsheets.
8.	ORDER8CL	designed for grids with up to 8 clusters. Usually is used to generate the reports for loading into TECHDOC Excel spreadsheets.
9.	ORDCPOOL	contains the orders introduced for microcode release 5.0.

Users can create own ORDER lists with own field sequence – just pick up and choose from a list (lists) and rearrange to fit your needs.

The other control parameters and their options

Apart ORDER statements the following control parameters may be specified for the program in the input dataset **SYSCNTL**:

	Parameter	Default	Affected reports	Description
	Parameters for selecting historical records to process			
1.	SDATE= ***ddMONyear***; SDATE= TODAY; SDATE= TODAY- ***nnn***; SDATE= LASTWEEK; SDATE= LASTWEEK- ***nnn***; SDATE= LASTMONTH; SDATE= LASTMONTH- ***mo***;	01JAN1995	All reports	SDATE & STIME define start date and time for reporting. The historical records with date time stamp less than SDATE & STIME are excluded from processing. • SDATE=TODAY; - SDATE is equal to the current system date; • SDATE= TODAY- ***nnn***; - SDATE is equal to the current system date minus ***nnn*** days; • SDATE= LASTWEEK; - SDATE is equal to the date of the **beginning** of the previous week (Sunday); • SDATE= LASTWEEK- ***nnn***; - SDATE is equal to the date of the **beginning** of the previous week (Sunday) minus ***nnn*** days; • SDATE= LASTMONTH; - SDATE is equal to the date of the **first** day of the month previous to the current month; • SDATE= LASTMONTH- ***mo***; - SDATE is equal to the date of the **first** day of the month that was on ***mo+1*** months before than the current month; • ***nnn*** – integer from 1 to 365; • ***mo*** – integer from 1 to 60; • ***hh:mm*** – time stamp, ***hh*** – hours, ***mm*** – minutes.
2.	STIME= ***hh:mm***;	00:00		
3.	EDATE= ***ddMONyear***; EDATE= TODAY; EDATE= TODAY- ***nnn***; EDATE= LASTWEEK; EDATE= LASTMONTH; EDATE= LASTMONTH- ***mo***;	01JAN2035	All reports	EDATE & ETIME define end date and time for reporting. The historical records with date time stamp bigger than EDATE & ETIME are excluded from processing. • EDATE=TODAY; - EDATE is equal to the current system date; • EDATE= TODAY- ***nnn***; - EDATE is equal to the current system date minus ***nnn*** days;

	Parameter	Default	Affected reports	Description
4.	ETIME= ***hh:mm***;	24:00		• EDATE= LASTWEEK; - EDATE is equal to the date of the **end** of the previous week (Saturday); • EDATE= LASTWEEK- ***nnn***; - EDATE is equal the date of the **end** of the previous week (Saturday) minus ***nnn*** days; • EDATE= LASTMONTH; - SDATE is equal to the date of the **last** day of the month that was previous to the current month; • EDATE= LASTMONTH- ***mo***; - SDATE is equal to the date of the **last** day of the month that was on ***mo+1*** months before than the current month; • ***nnn*** – integer from 1 to 365; • ***mo*** – integer from 1 to 60; • ***hh:mm*** – time stamp, ***hh*** – hours, ***mm*** – minutes.
5.	VTSNUM = ***mser***;		All reports	Request selecting the historical data about the cluster with the machine sequence number ***mser*** to be included for processing to simplify working with the reports. It can be several VTSNUM statements specified.
6.	SMFNUM = ***num***;	194	All reports	Defines SMF record type with historical data. Should be specified if SMF records with historical data is processed (the input with DD STATSMF is used). Obsolete.
	Parameters for adjusting input records before processing			
7.	UTCMINUS= ***nn***;		All reports	This parameter is used for adjusting historical records' time stamps to local time (west of Greenwich). Cannot be used together with UTCPLUS. ***nn*** – integer from 1 to 12 that means hours.
8.	UTCPLUS= ***nn***;		All reports	This parameter is used for adjusting historical records' time stamps to local time (east of Greenwich). Cannot be used together with UTMINUS. ***nn*** – integer from 1 to 14 that means hours.
9.	DLSER= ***frser toser***;		All reports	the request to replace the machine sequence number ***frser*** in the header of historical statistical records with the new value ***toser***. This may be necessary after the microcode upgrade if a cluster changes its sequence number (is a part of machine serial number) and the historical data before and after the upgrade are processed together.
10.	GRIDSER= ***frser toser***;		All reports	the request to replace the grid library sequence number ***frser*** in the header of historical statistical records with the new value ***toser***. Use GRIDSER= **?????** ***toser***; to replace binary 0 in library sequence number to a new value (***toser***).
	Control report parameters			
11.	REPORT= QTR; *or* REPORT= HRS;	QTR	All reports except: COMPARE DAYSMRY DAYHSMRY MONSMRY MNTHSMRY WEKHSMRY	the request for 15 minute reporting as generated by TS7700 (QTR) or hourly roll-up reporting (HRS). The options cannot be used together.
12.	REPORT= GRID;		All reports	the request to summarize the cluster data for by grids. Cannot be used with REPORT=FLOW and REPORT=SHOP.
13.	REPORT= SHOP;		All reports	the request to summarize the clusters & grids data by shop. Cannot be used with REPORT=FLOW and REPORT=GRID.
14.	REPORT= COMPARE; REPORT= COM;		COMPARE	the request to create the report COMPARE.
15.	REPORT= FLOW;		HOURFLOW	the request to create the report HOURFLOW.
16.	REPORT= HDSUM;		DAYHSMRY	the request to create the report DAYHSMRY.
17.	REPORT= DXFR;		DAYXFER	the request to create the report DAYXFER.
18.	REPORT= HXFR;		HOURXFER	the request to create the report HOURXFER.

	Parameter	Default	Affected reports	Description
19.	EUROFORMAT;	OFF	All reports	the request to use comma instead of period for fractional numbers.
20.	SPLITCLUSTERS;	OFF	DAYHSMRY HOURFLAT MNTHSMRY WEKHSMRY	the request to split the affected reports by the clusters.
21.	DATEFORM=***v***;		DAYHSMRY HOURFLAT WEKHSMRY	defines date format in the reports: • **ddMONyear** – if the parameter is not specified; • **year/DDD** – if DATEFORM=**J** (Julian); • **mm/dd/year** – if DATEFORM=**A** (American); • **dd/mm/year** – if DATEFORM=**E** (European); • **year/mm/dd** – if DATEFORM=**I** (ISO).
22.	SINGLESPACE;	OFF	DAYHSMRY HOURFLAT MNTHSMRY WEKHSMRY	the request to compress the line of the reports to leave one character's delimiter between the fields. If the parameter CSVDELIMITER is not specified then blank is used as a delimiter.
23.	CSVDELIMITER='***v***';			Defines a character that is used as a delimiter between the fields in the compressed report lines. The symbol 'N' can not be specified. Exceptions: • CSVDELIMITER='S'; should be specified to use semicolon as a delimiter; • CSVDELIMITER='B'; should be specified to use blank as a delimiter.
24.	ONEHEADING;	OFF	DAYHSMRY HOURFLAT HOURFLOW MNTHSMRY WEKHSMRY	the request to print the only heading at the top of the report – no heading between clusters.
25.	NOFILLER;	OFF	DAYHSMRY	the request not to output the filler lines. Otherwise, filler lines up to 30 lines per a cluster page will fill the report.
26.	SHOWVERSION;	OFF	HOURFLAT	the request to print a special title line with the program version info.
27.	PRIPOOL= ***<list>***;		H32GUP*nn*	defines primary pools to mark them in the reports as "primary". ***<list>*** is a list of POOL numbers. Example: *PRIPOOL= 1 2 05;*
28.	SECPOOL=***<list>***;		H32GUP*nn*	defines secondary pools to mark them in the reports as "secondary". ***<list>*** is a list of POOL numbers. Example: *SECPOOL= 12 25;*
			COMPARE DAYSMRY DAYHSMRY HOURFLAT MONSMRY MNTHSMRY WEKHSMRY	the request to exclude logical volumes data of secondary pools from **Active_LVols** and **Active_GB** counters.
29.	QUEAGEMINUTES;	OFF	H33GRID COMPARE DAYSMRY DAYHSMRY HOURFLAT HOURFLOW MONSMRY MNTHSMRY WEKHSMRY	the request to report Deferred Copy and Copy queue ages in minutes instead of seconds.
30.	USEGB;	OFF	COMPARE DAYSMRY DAYHSMRY HOURFLAT HOURFLOW MONSMRY MNTHSMRY WEKHSMRY	the request to report data sizes in GiB instead of Mib.

	Parameter	Default	Affected reports	Description
31.	NOHOUR24;	OFF	All reports except: HOURFLOW COMPARE DAYSMRY DAYHSMRY HOURFLAT MONSMRY MNTHSMRY WEKHSMRY	the request not to convert the time stamp 00:00:00 to the time stamp 24:00:00 of the previous day. The conversion is performed by default – the reports are more accurate in this case.
32.	LINES=***nnn***;	58	All reports except HOURFLOW COMPARE DAYHSMRY HOURFLAT MNTHSMRY WEKHSMRY	defines the size of the report page in lines.
33.	HRSDATE=***<date value>***;	01JAN1995	HOURFLAT	HRSDATE defines start date for the report **HOURFLAT**. The lines of the report related to the days before HRSDATE are excluded from the report. ***<date value>*** -can be specified in the same way as the parameter **SDATE**.
34.	HREDATE=***<date value>***;	01JAN2035	HOURFLAT	HREDATE defines end date for the report HOURFLAT. The lines of the report related to the days after HREDATE are excluded from the report ***<date value>*** - can be specified in the same way as the parameter **EDATE**.
35.	SELECTDOW= <***dow***>;		HOURFLOW HOURFLAT	Only the lines related to the selected day of week are output into the reports. <***dow***> - one from the following: **SUN**, **MON**, **TUE**, **WED**, **THR**, **FRI**, **SAT**.

See more information about using date filters is in the member **VEHDATES** of the library **IBMTOOLS.JCL** from the installation package.

Typical content of VEHSTATS job log

Below is an example of the information messages that the program outputs to a job log. The number of the messages may vary depending on the input file content.

```
+-------------------------------------------------------------------------------------------------------
+program VEHSTATS started (built 20344-05.37
+-------------------------------------------------------------------------------------------------------
+  REPORT= HRS FLOW COM HDSUM HXFR DXFR
+                      ------From-----   ------To-------
+  SELECTION interval   01JAN1995  0:00   01JAN2035 24:00
+ INPUT DATA interval   31JUL2020  0:15   09SEP2020 24:00
+  interval TO REPORT   31JUL2020  0:15   09SEP2020 24:00
+            reported interval,  days  :      41
+            records read from STATSU  :   66332
+            records read from STATSVB :       0
+statistical records read from STATSMF :       0
+ non-statistical records in the input :      46
+   corrupted statistical records:       5 <- RC=16(see RECLIST report)
+          records DLSER   applied for :       0
+          records GRIDSER applied for :       0
+          records selected            :   66286
+ DUPLICATES dropped(in selected):      15
+  Number of selected BVIR records by GRIDs, CLUSTERs and record TYPEs
+-----+--------+----------------+<----------------------accepted---------------------><skipped>
+ grid|cluster |  code Level    | total |  x20  |  x21  |  x30  |  x31  |  x33  |  x35  | stats.|
+-----+--------+----------------+-------+-------+-------+-------+-------+-------+-------+-------+
+BA038|CL03A910|008.051.000.0047|  22720|   3780|   3780|   3791|   3791|   3791|   3787|      4|
+     |        |008.051.000.0063|       |       |       |       |       |       |       |       |
+     |CL43A920|008.051.000.0047|  22725|   3786|   3786|   3790|   3790|   3790|   3783|      7|
+     |        |008.051.000.0063|       |       |       |       |       |       |       |       |
+     |CL51A4F0|008.051.000.0047|  20774|   3463|   3463|   3464|   3464|   3464|   3456|      8|
+     |        |008.051.000.0063|       |       |       |       |       |       |       |       |
+VEHSTATS: order "RetDurn_CPOOL " is not supported - IGNORED, RC=4
+   Statistics about types of automatic mapping for x33 BVIR records
+-----+----------+-----+-----+-----+-----+-----+-----+-----+-----+-----
+ grid| mapping  | CL0 | CL1 | CL2 | CL3 | CL4 | CL5 | CL6 | CL7 |total
```

```
33. +-----+----------+-----+-----+-----+-----+-----+-----+-----+-----+-----
34. +44354| reliable |     |     |84.6%|99.0%|83.1%|     |     |     |89.1%
35. +     |unreliable|     |     |15.4%| 1.0%|16.8%|     |     |     |10.9%
36. +-------------------------------------------------------------------------
37. +x33 records with unreliable type of mapping:     949 of    8696(10.9%)
38. +Numbers in reports related to clusters data exchange are wrong.
39. + The list of Cloud Pools from the input
40. +-----+----------+---------------------+-----+
41. + grid| NickName | Cloud Pool ID       |index|
42. +-----+----------+---------------------+-----+
43. +BA038| BUBBA_01 | 3A91020200401213519 |   1 |
44. +     | BUBBA_02 | 3A91020200402204817 |   2 |
45. +     | BUBBA_03 | 3A91020200421173529 |   3 |
46. +     | BUBBA_04 | 3A91020200421173546 |   4 |
47. +     | BUBBA_05 | 3A91020200421173841 |   5 |
48. +     | BUBBA_06 | 3A91020200421173911 |   6 |
49. +     | BUBBA_07 | 3A91020200421173955 |   7 |
50. +     | BUBBA_08 | 3A91020200421174016 |   8 |
51. +     | BUBBA_09 | 3A91020200421181009 |   9 |
52. +     | BUBBA_10 | 3A91020200421181029 |  10 |
53. +     | BUBBA_16 | 3A91020200710230952 |  11 |
54. +     | CLDP01   | 3A91020200715164137 |  12 |
55. +     | CLDP02   | 3A91020200715164156 |  13 |
56. +     | CLDP03   | 3A91020200715164223 |  14 |
57. +     | CLDP04   | 3A91020200715164252 |  15 |
58. +     | CLDP05   | 3A91020200715164400 |  16 |
59. +     | CLDP01   | 3A91020200812182215 |  12 |
60. +     | CLDP02   | 3A91020200812182335 |  13 |
61. +     | CLDP03   | 3A91020200812182606 |  14 |
62. +     | CLDP04   | 3A91020200812182728 |  15 |
63. +     | CLDP05   | 3A91020200812182903 |  16 |
64. +     | CLDP07   | 3A91020200813161720 |  17 |
65. +     | EXPOOL   | 3A92020200817181157 |  18 |
66. +-----+----------+---------------------+-----+
67. +-----------------------------------------------------------------------------------------------------
68. +program VEHSTATS ended. Return Code =  4
69. +program VEHSTATS terminated due to errors.
70. +-----------------------------------------------------------------------------------------------------
```

- the line 2 contains the program version stamp;
- the lines 4 – 6 show the effective values of the SDATE & STIME and EDATE & ETIME and some other parameters;
- the line 7 shows the interval that the historical records from the input file report to;
- the lines 8 show the actual reported interval;
- the line 9 shows the number of the days in the actual reported interval;
- the lines 10 – 18 show some statistics about the input data;
- the line 14 is output only if the corrupted historical records are detected in the input (see more details in the **Appendix A**);
- the line 18 is output only if duplicated statistical records in the input detected;
- the lines 19 – 28 contain the information about the microcode release and the number of the selected input historical records by grids, clusters and the record types. The second line for a cluster (f.e. line 24) is output if microcode release is upgraded during the reported period;
- the line like line 29 is output if the program detected an incorrect order in the input parameters;
- the lines 30 – 38 show the results of the automatic mapping for the x33 historical records and are output only if problems detected in mapping;
- the lines 39 – 66 contain the info about cloud pools detected in the input. Not output if no cloud pools data;
- the line 68 is output if no errors detected. Otherwise, the line 69 is output.

Error and warning messages that may be output to VEHSTATS job log

In the table below, error messages have message ID like **E*nnn*** and warning messages have message ID like **W*nnn***. In case issuing a warning message the program continues its work.

Message ID	Message text	Description
E001*	PARM NOT FOUND	Issued every time when a parameter with wrong keyword detected in the input dataset **SYSCNTL.** The program ends abnormally. * - Obsolete. The other message instead this one is output to the protocol SYSLIST in the COMPARSE version 18104-08.54 and later is used. The program VEHSTATS still ends abnormally if the situation occurs.

Message ID	Message text	Description
E002	SEE SYSLIST FOR CONTROL PARM ERROR COMPARSE: PARSING error(s) detected. See SYSLIST protocol. COMPARSE: PARSING error(s) detected. Rerun the program with SYSLIST DD to get the protocol.	Issued if error message(s) is detected during parsing process. The version of the message #1 is issued by the COPMARSE version before April 2018. The version of the message #3 is issued if COMPARSE version 18104-08.54 and later (called by VEHSTATS) is running without DD SYSLIST and error detected. The program ends abnormally.
E003	VEHSTATS: do NOT use GRID or SHOP and FLOW at the same time	FLOW option ignored.
E004	DO NOT USE HRS AND QTR AT THE SAME TIME	QTR option ignored
E005	SORTIN DD is not specified	The program ends abnormally
E006	SORTOUT DD is not specified	
E007	NO INPUT DD NAMES FOUND	Issued if none from DD – STATSU, STATSVB, STATSMF – are specified in the job. The program ends abnormally.
E008	VEHSTATS: NO STATISTICS PRESENT VEHSTATS: CHECK SDATE/EDATE/VTSNUM FILTERS.	Issued if the input to be processed is empty after the filters applying. The program ends abnormally.
E009	VEHSTATS: NO ORDER PARMS found	The program detected that there are no ORDER statements in the input dataset **SYSCNTL.** The program ends abnormally.
E010	COMPARE REPORT LINE NEEDS TO BE INCREASED. CURRENT LENGTH ONLY HANDLES 50 CLUSTERS. NOTIFY **TAPETOOL@US.IBM.COM** FOR CHANGE. OR RUN WITH FEWER CONCURRENT CLUSTERS.	Issued if the input with historical data contains more than 50 different clusters. The program ends abnormally for versions built before December 2017 (17347-09.42).
E011	CHANGE HYDRMSUV TO PROCESS > 60 MONTHS DATA	Issued if the input with historical data contains the data for more than 60 different months. The program ends abnormally for versions built before December 2017 (17347-09.42).
E012	HYDR***xxxx***-20 HAS BAD DATE FOR DMY2JUL	Issued if an error detected when the date is converted to Julian layout. The program ends abnormally for versions built before December 2017 (17347-09.42).
E013	VEHSTATS: non-zero return from SORT. NON-ZERO RETURN FROM SORT	Something went wrong with the SORT program. Rerun the job, if the situation is persisted notify tapetool@us.ibm.com. The program ends abnormally.
E014*	**ddMONyear hh:mm:ss <*grid*> <*cluster*>** Record X30 has PARTITION SIZE=0 Please NOTIFY **tapetool@us.ibm.com**	Issued if historical record of the type x30 has the length of cache partition 0 is equal 0 If the number of such records is bigger than 5 then the program ends abnormally with the abend code U0032. * - this message is removed in the VEHSTATS version 18121-13.40 and later
E015	FLD_POS>ORD_CNT	Internal errors – notify tapetool@us.ibm.com The program ends abnormally. * - this message is removed in the VEHSTATS version 18121-13.40 and later
E016	error: FLD_POS > ORDER_CNT for WEKHSMRY	
E017*	INTERVAL=0	
W001	IBM TAPE TOOLS LIBRARY EXPIRES IN ***nn*** DAYS	Issued if the difference between the date in the EXPIRE statement and the current date is less than 30.
W002	***<XXXXXXXX>*** DD is not specified. The report won't be created	
W003	***<XXXXXXXX>*** DD is not opened OK. The report won't be created	
W004	VEHSTATS: do NOT use SHOP and GRID at the same time option REPORT=GRID ignored. RC=4	
W005	VEHSTATS: report DAYXFER can't be created with GRID or SHOP option option REPORT=DXFR ignored. RC=4	
W006	VEHSTATS: report HOURXFER can't be created with GRID or SHOP option option REPORT=DXFR ignored. RC=4	
W007	x33 records with unreliable type of mapping: ***nnnn*** of ***mmmm*** (***pp.p***%) Numbers in reports related to clusters data exchange **may be distorted** | **are wrong**.	The program detected historical records of x33 type with improper number of Grid-Cluster containers for which it is impossible identify the cluster numbers for sure. The return code is set to 4 if the number of such records is small enough and 8 if not.
W008	VEHSTATS: order "***xxxxxxxxx***" is not supported. IGNORED, RC=4.	
W009	VEHSTATS: DAYXFER report won't be created due to memory lack	

Message ID	Message text	Description
W010	HOURFLOW: QUEUE FLD overflow. Apply USEGB parameter	* - this message is removed in the VEHSTATS version 18121-13.40 and later
W011	VEHSTATS:HOURXFER report won't be created due to memory lack	
W012	Avg Defer Que Age > 24 hours Possibly a volume stuck in copy queue. Use Management Interface to check queue. Logical Volumes - Incoming Copy Queue - Download Contact IBM Service for resolution.	
W013	DROPPING LONG HEX32 RECORDS	Issued if the program detected the historical record of x32 type for microcode releases from 8.20.0.00 to 8.20.0.45.
W014*	POOL MB written has bad value. 9999999 used.	* - this message is removed in the VEHSTATS version 18058-11.27 and later
W015*	ONLY REPORTING 2 MEDIA TYPE PER POOL	* - this message is removed in the VEHSTATS version 18058-11.27 and later

Return codes and abends

The program VEHSTATS return codes:

Code	Related messages	Explanation
0		Completed normally.
4	W007	Small enough number of x33 historical records with irregular layout detected.
	W008	Wrong ORDER(s) detected in the program input.
	W004 W005 W006	Controversial combination in the report options.
8	W007	Big enough number of x33 historical records with irregular layout detected in the input historical file.
16		The program detected corrupted historical records in the input. See the report RECLIST for the details.

The program VEHSTATS may terminate itself with the following abend codes:

Code	Related messages	Explanation
U0008	E001 E002	Error (s) detected in the control parameter program input. See the error message with the details in the SYSLIST dataset.
	E013	Non-zero return code from SORT utility.
	E010	Number of the cluster in the input historical file is bigger than 50.
	E011	Number of the months in the input historical file is bigger than 60
U0016	E004	HRS and QTR options are specified simultaneously
	E003	FLOW option is specified together with GRID or SHOP option
	E007	no input DD - SVTSATU, STATSVB, STATSMF specified in the job
	E008	The program detected that there are no historical records to process
	E009	There are no ORDER parameters in the program input
	E005 E006	DD SORTTIN or DD SORTUT are not specified in the task
	E012	there was an error converting the date
	E015 E016	Internal error #1
	E017	Internal error #2
U0017	E015	Internal error #3
U0032		Internal error #4
	E014	Detected more than 5 of the x30 historical records that have the size of the cache partition 0 is equal 0. (removed in the VEHSTATS version 20195-03.26 and later)

Appendix A. RECLIST report

Below is an extract from the actual RECLIST report. There are 4 groups of the lines in the report;

1. the lines that contain time stamps for all input historical records;
2. the lines that contain information about duplicated historical records;
3. the lines that show the configuration information;
4. the lines that shows the result of the automatic mapping for each x33 record from the program input.

```
TIMESTAMPS IN THIS REPORT ARE BOX TIMES AND NOT MODIFIED BY UTCMINUS OR UTCPLUS
  1500855300=24JUL2017  0:15:00  44354  CL2H6915  REL=008.032.002.0001  RECORDS=0005
  1500855300=24JUL2017  0:15:00  44354  CL3H7089  REL=008.032.002.0001  RECORDS=0005
  1500855300=24JUL2017  0:15:00  44354  CL4H6208  REL=008.032.002.0001  RECORDS=0005
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  1502020800=06AUG2017 12:00:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0005
  1502021700=06AUG2017 12:15:00  44354  CL2H6915  REL=008.033.002.0009  RECORDS=0005      --> Selected
  1502021700=06AUG2017 12:15:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0005      --> Selected
  1502022600=06AUG2017 12:30:00  44354  CL2H6915  REL=008.033.002.0009  RECORDS=0005      --> Selected
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  1503570600=24AUG2017 10:30:00  44354  CL2H6915  REL=008.033.002.0009  RECORDS=0005      --> Selected
  1503570600=24AUG2017 10:30:00  44354  CL3H7089  REL=008.033.002.0009  RECORDS=0005      --> Selected
  1503570600=24AUG2017 10:30:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0005      --> Selected
  1503571500=24AUG2017 10:45:00  44354  CL2H6915  REL=008.033.002.0009  RECORDS=0005
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  1503592200=24AUG2017 16:30:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0005
  1503593100=24AUG2017 16:45:00  44354  CL2H6915  REL=008.033.002.0009  RECORDS=0005
  1503593100=24AUG2017 16:45:00  44354  CL3H7089  REL=008.033.002.0009  RECORDS=0005
  1503593100=24AUG2017 16:45:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0005
Record # V-0043496      undefined record type  -> '00'x      Header dump: 4B1B-00-00-0E-14-0000-0E103F3F-{   d-¿Øø- 3957V07}
Record # V-0043497      undefined record type  -> '00'x      Header dump: 2BA3-00-00-25-3B-0000-25400532-{   d-¿Øø- 3957V07}

  1502017200=06AUG2017 11:00:00  44354  CL3H7089  REL=008.032.002.0001  RECORDS=0005      Duplication, not Selected
  1501066800=26JUL2017 11:00:00  44354  CL4H6208  REL=008.032.002.0001  RECORDS=0001      Duplication, not Selected
  1502967600=17AUG2017 11:00:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0001      Duplication in Selected
  1501066800=26JUL2017 11:00:00  44354  CL4H6208  REL=008.032.002.0001  RECORDS=0001      Duplication, not Selected
  1502967600=17AUG2017 11:00:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0001      Duplication in Selected
  1501066800=26JUL2017 11:00:00  44354  CL4H6208  REL=008.032.002.0001  RECORDS=0001      Duplication, not Selected
  1502967600=17AUG2017 11:00:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0001      Duplication in Selected
  1501066800=26JUL2017 11:00:00  44354  CL4H6208  REL=008.032.002.0001  RECORDS=0001      Duplication, not Selected
  1502967600=17AUG2017 11:00:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0001      Duplication in Selected
  1501066800=26JUL2017 11:00:00  44354  CL4H6208  REL=008.032.002.0001  RECORDS=0001      Duplication, not Selected
  1502967600=17AUG2017 11:00:00  44354  CL4H6208  REL=008.033.002.0009  RECORDS=0001      Duplication in Selected
                      Configuration Info
##  Grid   TimeStamp   CLNmb  CLId  MSer   NDL  Activity 1         Activity 2
01  44354  1503139500      3     2  H6915    3  1:0:0              0:1:1
            19AUG2017            3  H7089    3  0:1:0              1:0:1
             10:45:00            4  H6208    3  0:0:1              1:1:0
                            ----------------------------
02  44354  1503179100      2     2  H6915    2  1:0                0:0
            19AUG2017            3  H7089    3  0:0:0              1:0:0
             21:45:00
                            ----------------------------
03  44354  1503593100      3     2  H6915    2  1:0                0:1
            24AUG2017            3  H7089    3  0:1:0              1:0:1
             16:45:00            4  H6208    1  0                  1
                            ----------------------------
  1502021700=06AUG2017 12:15:00  44354  CL2H6915    NDLs=3->5 Rule=2 Clusters: 2-3-4
  1502021700=06AUG2017 12:15:00  44354  CL4H6208    NDLs=3->5 Rule=2 Clusters: 2-3-4
  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
  1503570600=24AUG2017 10:30:00  44354  CL2H6915    NDLs=2->5 Rule=3 Clusters: 2-3
  1503570600=24AUG2017 10:30:00  44354  CL3H7089    NDLs=3->5 Rule=1 Clusters: 2-3-4
  1503570600=24AUG2017 10:30:00  44354  CL4H6208    NDLs=1->5 Rule=3 Clusters: 2
```

Every line from the first group contains:

- the decimal value of the record time stamp in seconds;
- the time stamp above converted from the seconds to the **ddMONyear hh:mm:ss** layout;
- the grid library sequence number;
- the cluster number concatenated with the cluster's sequence number;
- the microcode level follows after the literal "**REL=**";
- the number of the historical records with the same grid, cluster number and time stamp follows after the literal "**RECORDS=**". This number is usually equal **5** for the cluster without tapes and **6** for clusters with tapes but may differ from these values sometimes;
- the lines that describe the historical record selected for further processing are marked by the literal "**→ Selected**"
- within the lines of this group, the message about corrupted historical records may be output. Such a message contains the number of the corrupted record in the input file with the prefix, the explanation what is wrong in the record and the dump of the record header. Prefix "**U**" means that the corrupted record was read from the file STATSU, "**V**" – from the file STATSVB;

The lines from the second group show the information about the duplicated historical records that are discarded from the input.

The lines of the group 3 ("Configuration info") and from the group 4 (about the result of automatic mapping) are described in the Appendix B.

Appendix B. VEHSTATS logic - general description

Step 0. Parse and Validate control statements.

Step 1. Read BVIR records from the input files:

- apply DLSER and GRIDSER if any;
- convert x30 and x32 records with old layouts to the new formats;
- apply UTCPLUS or UTCMINUS and store records for further processing;
- output info about BVIR records into the RECLIST report

Step 2. Sort records to group potential duplicated records and remove them.

The historical BVIR records with the non-standard timestamp (after cluster reboot) are also considered as duplicates if the difference between their timestamp and the timestamp of the previous normal set of BVIR records with the same grid, cluster and record type are less than 900 seconds. The info about duplications is output into RECLIST reports. Example:

```
1466991900=27JUN2016  1:45:00  777CC  CL1H1111  REL=008.033.000.0045  RECORDS=0005       Duplication in Selected
1465929900=14JUN2016 18:45:00  777CC  CL1H1111  REL=008.033.000.0045  RECORDS=0005       Duplication in Selected
```

Step 3. Sort to transfer some data between BVIR records of some types and maintain the statistic about input (see example below) directed into the job log:

```
+  Number of selected BVIR records by GRIDs, CLUSTERs and record TYPEs
+-----+--------+-------+-------+-------+-------+-------+-------+-------
+ grid|cluster |  x20  |  x21  |  x30  |  x31  |  x32  |  x33  |  total
+-----+--------+-------+-------+-------+-------+-------+-------+-------
+777CC|CL0H0000|     24|     24|     25|     25|     25|     25|    148
+     |CL1H1111|     23|     23|     23|     23|     23|     23|    138
+     |CL2H2222|     25|     25|     25|     25|      0|     25|    125
+     |CL3H3333|     25|     25|     25|     25|      0|     25|    125
+     |CL4H4444|     24|     24|     25|     25|      0|     25|    123
+     |CL5H5555|     25|     25|     25|     25|      0|     25|    125
+777DD|CL1H1112|   1373|   1373|   1373|   1373|   1373|   1373|   8238
+     |CL2H2223|   1377|   1377|   1377|   1377|      0|   1377|   6885
+     |CL3H3334|   1377|   1377|   1377|   1377|      0|   1377|   6885
+-----------------------------------------------------------------------
```

Step 4. Collect the configuration info.

- Sort the input to group x33 historical records with same time stamps;
- ALL x33 records in the input are scanned;
- The same configurations for adjoining intervals are condensed in one element;
- The result of the analysis is output to RECLIST report (see the example below).

```
                          Configuration Info
##  Grid   TimeStamp    CLNmb  CLId  MSer   NDL   Activity 1          Activity 2
01  777CC  1466991900       6     0  H0000    3   0:0:0               0:0:0
             27JUN2016          1  H1111    3   0:1:0               0:0:0
               1:45:00          2  H2222    3   0:0:1               1:1:0
                                3  H3333    3   0:0:0               1:1:1
                                4  H4444    3   0:0:0               0:0:1
                                5  H5555    3   0:0:0               0:0:1
                              ----------------------------
02  777CC  1466993700       5     0  H0000    3   0:0:0               0:0:0
             27JUN2016          2  H2222    3   0:0:0               0:0:0
               2:15:00          3  H3333    3   0:0:0               0:0:1
                                4  H4444    3   0:0:0               0:0:1
                                5  H5555    3   0:0:0               0:0:1
                              ----------------------------
03  777CC  1468339200       6     0  H0000    3   1:0:0               0:1:1
             12JUL2016          1  H1111    6   0:1:0:0:0:0         1:0:1:1:1:1
              16:00:00          2  H2222    3   0:0:1               1:1:0
                                3  H3333    3   0:0:0               1:1:1
                                4  H4444    6   0:0:0:0:1:0         1:1:1:1:0:1
                                5  H5555    3   0:0:0               1:1:1
                              ----------------------------
04  777DD  1466942400       3     1  H1112    3   1:0:0               0:1:1
             26JUN2016          2  H2223    3   0:1:0               1:0:1
              12:00:00          3  H3334    3   0:0:1               1:1:0
```

- primary sort key is grid so the info for grid 777DD is in the last row also the records created earlier than records of 777CC grid;
- NDL actually the number of Cluster Grid containers in x33 records for the particular cluster - should be equal to the number of clusters (CLNmb) but sometimes not;
- Activity 1 and Activity 2 bits that show interactions between clusters. Not used for conclusions.

Step 5. Automatic mapping for x33 historical records

- Rescan the input to define an explicit list of clusters (automatic mapping) for every x33 record
- convert x33 records to internal standard layout for processing;
- output the report about the mapping into the job log (see example below)
- Send only selected records for further processing.

```
+   Statistics about types of automatic mapping for x33 BVIR records
+-----+----------+-----+-----+-----+-----+-----+-----+-----+-----+-----
+ grid| mpng type| CL0 | CL1 | CL2 | CL3 | CL4 | CL5 | CL6 | CL7 |total
+-----+----------+-----+-----+-----+-----+-----+-----+-----+-----+-----
+7443C| reliable |   0%|91.3%|   0%|   0%|84.0%|   0%|     |     |28.4%
+     |unreliable| 100%| 8.7%| 100%| 100%|16.0%| 100%|     |     |71.6%
+7445C| reliable |     | 100%|99.7%|99.7%|     |     |     |     |99.8%
+     |unreliable|     |   0%| 0.3%| 0.3%|     |     |     |     | 0.2%
+-------------------------------------------------------------------------
+x33 records with unreliable type of mapping:     114 of    4275( 2.6%)
+Numbers in reports related to clusters data exchange may be distorted.
+-------------------------------------------------------------------------
```

VEHSTATS considers automatic mapping type as **RELIABLE** in 2 cases:

- **"Full set"** if the number of x33 records for an interval for all clusters in a grid is equal to the number of Cluster - GRID containers in each x33 record available. In this case, the list of clusters that produced x33 records are the cluster list for automatic mapping.
- **"Partial Set"** - the number of x33 records for an interval all clusters in a grid is less then number of Cluster - GRID containers in each x33 record but the number of the containers are the same in all x33 records present and exists "full set" configuration item (built on step 4). In this case, the list of clusters are taken from the configuration item. It may happen when one cluster is shut down for a short time
- **The other cases** are considered as **UNRELIABLE**. In this case, the cluster list is taken from a corresponding configuration item by timestamp.

For diagnostic purposes the info about automatic mapping are directed into RECLIST report:

```
1466993700=27JUN2016  2:15:00  7443C  CL5H7156    NDLs=3->6 Rule=3 Clusters: 0-2-3
1467014400=27JUN2016  8:00:00  7443C  CL0H5345    NDLs=3->6 Rule=3 Clusters: 0-1-2
1467014715=27JUN2016  8:05:15  7443C  CL1H6253    NDLs=6->6 Rule=1 Clusters: 0-1-2-3-4-5
1467014400=27JUN2016  8:00:00  7443C  CL2H7484    NDLs=3->6 Rule=3 Clusters: 0-1-2
1467014400=27JUN2016  8:00:00  7443C  CL3H7488    NDLs=3->6 Rule=3 Clusters: 0-1-2
1467014719=27JUN2016  8:05:19  7443C  CL4H7202    NDLs=6->6 Rule=1 Clusters: 0-1-2-3-4-5
1467014400=27JUN2016  8:00:00  7443C  CL5H7156    NDLs=3->6 Rule=3 Clusters: 0-1-2
```

Rule=1 or 2 - RELIABLE mapping (correspond cases 1 or 2 above), Rule=3 - UNRELIABLE mapping.

VEHSTATS evaluates the overall result of the automatic mapping:

- if no cases of UNRELIABLE mapping then return code is set to 0;
- if cases of UNRELIABLE mapping detected then the following message is output:
  `+x33 records with unreliable type of mapping:     114 of    4275( 2.6%)`
- if the number of UNRELIABLE mapping is less then 5% from the number of all x33 records then return code is set to 4 and the message is directed to syslog:
  `+Numbers in reports related to clusters data exchange may be distorted.`
- if the number of UNRELIABLE mapping is bigger then 5% from the number of all x33 records then return code is set to 8 and the message is directed to syslog:
  `+Numbers in reports related to clusters data exchange are wrong.`

Cases of UNRELIABLE mapping in general distort numbers in the following reports: H33GRID, HOURFLOW, DAYHSMRY, HOURFLAT, MNTHSMRY, WEKHSMRY, COMPARE, DAYSMRY and MONSMRY.

Step 6. SORT selected records depending on option (SHOP, GRID, HRS and QTR) to build the reports.

Appendix C. Example of the SYSLIST protocol

The SYSLIST protocol for the COMPARSE version April 2018 and after

The text marked in green is the file and page headers. The text marked in read is the text of error messages.

```
COMPARSE (18104-08.54)        Line  Stmt   SYSCNTL control statements' source                run on 02MAY2018 04:48    Page   1
                                 1     1 +  EXPIRE=30APR2018 35426160 ;                                                  02900499
                           Error --->      Incorrect control statement's operand(s).
   !!! ATTENTION --> You have EXCEEDED your EXPIRATION date.  You may be running with an obsolete version of the program.
       GO to the download FTP site: ftps://ftp.software.ibm.com/storage/tapetool to get the latest version and install it.
       USERS are advised to look at UPDATES.TXT file from the site at LEAST once a month to see if changes affect their OPERATION
                                 2           *                                                                         02900599
                                 3           * THE ORDER STATEMENTS DETERMINE WHICH FIELDS WILL BE REPORTED IN THE    02900699
                                 4           *  DAYSMRY, MONSMRY, HOURFLAT, DAYHSMRY, AND WEKHSMRY REPORTS AND WHAT  02900799
                                 5           *  ORDER THEY WILL APPEAR IN.                                            02900899
                                 6           *  PICK AND CHOOSE FROM THIS LIST AND RE-ARRANGE TO FIT YOUR NEEDS.      02900999
                                 7           *                                                                        02901099
                                 8           *  IBMTOOLS.JCL(ORDERV12) IS THE DEFAULT MEMBER OR YOU CAN CREATE YOUR   02901199
                                 9           *   OWN MEMBER WITH YOUR FIELDS AND SEQUENCE.                            02901299
                                10           *                                                                        02901399
                                11           *  THIS MEMBER, ORDERALL, IS FOR USE WHEN RUNNING VEHSTATS TO PRODUCE
                                12           *     THE DAYHSMRY & HOURFLAT FLAT FILES.  INITIALLY SET FOR CL1,3,4,5
                                13           *  USE THIS DEFAULT MEMBER OR CREATE YOUR OWN ORDER MEMBER FROM THESE
                                14           *   DEFINED FIELDS.
                                15           ***************** NEW FIELDS WILL BE ADDED OVER TIME *******************
                                16           ************ FOR NOW THESE ARE THE ONES AVAILABLE **********************
                                17           ************************************************************************
                                18        2 +  ORDER='    CODE LEVEL';   MICRO CODE LEVEL AT END OF INTERVAL (DA/MO)
                                19        3 +  ORDER='DAYS W/ACTIVTY';   NUM DAYS WITH ACTIVITY FOR MONSMRY
                                20        4 +  ORDER='    UTC OFFSET';   UTC OFFSET VALUE SPECIFIED
                                21           *
                                22        5 +  ORDER='SECTION:               ';           SECTION HEADING
                                23        6 +  ORDER='SECTION:TS7700 CAPACITY';           SECTION HEADING
                                24        7 +  ORDER='      TVC SIZE';  TOTAL TVC SIZE AVAILABLE
                                25        8 +  ORDER='  ACTIVE LVOLS';  TOTAL ACTIVE LOGICAL VOLUMES
                                26        9 +  ORDER='    ACTIVE GBS';  TOTAL ACTIVE GB OF DATA
                                27       10 +  ORDER='     VV IN TVC';  NUMBER VIRTUAL VOLUMES IN TVC
                                28       11 +  ORDER='     GB IN TVC';  AMOUNT OF VIRTUAL VOLUMES IN TVC (GB)
                                29       12 +  ORDER='LVOLS ON TAPES';  NUMBER OF LOGICAL VOLUMES ON TAPES
                                30       13 +  ORDER='   GB ON TAPES';  AMOUNT OF LOGICAL VOLUMES ON TAPES (GB)
                                31       14 +  ORDER='  AVG CPU UTIL';  AVG CPU (PROCESSOR) UTILIZATION
                                32       15 +  ORDER='  MAX CPU UTIL';  MAX CPU (PROCESSOR) UTILIZATION
                                33           *
                                34       16 +  ORDER='SECTION:               ';           SECTION HEADING
                                35       17 +  ORDER='SECTION:VIRTUAL MOUNTS';           SECTION HEADING
                                36       18 +  ORDER='      TOT MNTS';   TOTAL NUMBER OF VIRTUAL MOUNTS
                                37       19 +  ORDER='       SCRATCH';   NUMBER SCRATCH MOUNTS
                                38       20 +  ORDER='        RD HIT';   NUMBER OF READ HITS IN CACHE
                                39       21 +  ORDER='       RD MISS';   NUMBER OF READ MISSES
                                40       22 +  ORDER='   MOUNT HIT %';   HIT %
                                41       23 +  ORDER='   AVG MNT SEC';   AVERAGE VIRTUAL MOUNT TIME IN SECONDS
                                42       24 +  ORDER='AVG SCR MT SEC';   AVG SCRATCH MOUNT TIME IN SECONDS
                                43       25 +  ORDER='AVG RD HIT SEC';   AVG READ HIT MOUNT TIME IN SECONDS
                                44       26 +  ORDER='AVG RD MIS SEC';   AVG READ MISS MOUNT TIME IN SECONDS
                                45       27 +  ORDER='          SYNC';   NUMBER SYNC MOUNTS
                                46       28 +  ORDER='  AVG SYNC SEC';   AVG SYNC MOUNT TIME IN SECONDS
                                47       29 +  ORDER=' MAX VIRT DRVS';   MAX VIRTUAL DRIVES CONCURRENTLY MOUNTED
                                48       30 +  ORDER=' AVG VIRT DRVS';   AVG VIRTUAL DRIVES CONCURRENTLY MOUNTED
                                49           *
                                50       31 +  ORDER='SECTION:               ';           SECTION HEADING

COMPARSE (18104-08.54)        Line  Stmt   SYSCNTL control statements' source                run on 02MAY2018 04:48    Page  24
                              1239           *                                                          FILES 03160052
                              1240           *ONEHEADING;   ONLY ONE HEADING ON FLAT FILES, NOT BETWEEN CLUSTERS     03170099
                              1241           *NOFILLER;     DO NOT WRITE FILLR LINES TO DAYHSMRY                     03180000
                              1242           *SHOWVERSION;  WRITE ID HEADER TO HOURFLAT FILE                         03190099
                              1243           *PRIPOOL= 1 32;                                                        03200099
                              1244           *SECPOOL= 15 25;          DEFINE SECONDARY POOLS SO LVOLS DON'T GET     03210027
                              1245           *                         COUNTED TWICE FOR ACTIVE_LVOLS FIELD         03220027
                              1246      1143 +  QUEAGEMINUTES;  REPORT DEF & RUN QUEUE AGE AS MINUTES, NOT SECONDS     03230099
                              1247      1144 +  USEGG;    FOR HOURFLOW, REPORT QUEUE AS GIB IF > THAN 999999 MIB       03240099
                           Error --->      Control statement's keyword is not recognized.
                              1248           *REPORT= HRS;           HRS ROLL-UP, COMPARE, AND FLAT FILE SMRY        03250099
                              1249      1145 +  REPORT= QTR;           HRS ROLL-UP, COMPARE, AND FLAT FILE SMRY        03250199
                              1250      1146 +  REPORT= COM;           COMPARE                                         03250299
                              1251      1147 +  REPORT= HDSUM;                                                       03251099
                              1252      1148 +  REPORT= HXFR;                                                        03251199
                              1253      1149 +  REPORT= DXFR;                                                        03252099
                              1254      1150 +  REPORT= FLOW;                                                        03253099
                              1255           *REPORT= GRID;                                                         03254099
                              1256           *REPORT= SHOP;                                                         03255099
                              1257           *      = QTR      REQUEST 15 MINUTE REPORTING AS GENERATED BY TS7740   03260000
                              1258           *      = HRS      REQUEST HOURLY ROLL-UP REPORTING                     03270000
                              1259           *      = FLOW     REQUEST DATA FLOW BY CLUSTER - CAN'T USE WITH GRID   03280035
                              1260           *      = GRID     SUMMARIZES ALL CLUSTERS BY GRID - CAN'T USE W/FLOW   03290035
                              1261           *      = SHOP     SUMMARIZES ALL CLUSTERS WITHIN SHOP                  03300011
                              1262           *      = COMPARE  REQUEST SIDE BY SIDE CLUSTER COMPARISON              03310000
                              1263           *      = HDSUM    DAILY SUMMARY FLAT FILE - HORIZONTAL 1 DAY/LINE      03320000
                              1264           *      = HXFR     FOR HOURLY ON DEMAND TRANSFER REPORTING              03330055
                              1265           *      = DXFR     FOR DAILY ON DEMAND TRANSFER REPORTING               03340055
                              1266           *UTCMINUS= 07;     ADJUST UTC TO LOCAL TIME WEST OF GREENWICH          03350099
                              1267           *UTCPLUS=  01;     ADJUST UTC TO LOCAL TIME EAST OF GREENWICH          03360099
                              1268           *                                                                      03370000
                              1269           *  SEE MEMBER, VEHDATES, FOR MORE DETAIL ON DATES                      03380000
```

```
                    1270         *                                                                      03390000
                    1271         *      DEFAULT SDATE/EDATE ARE 01JAN1995/01JAN2035                     03400053
                    1272         *SDATE=    THISMONTH- 1;     REPORT JUST YESTERDAY'S DATA               03420099
                    1273         *EDATE=    THISMONTH;        END DATE FOR OUTPUT REPORTING              03420199
                    1274         *SDATE=    LASTMONTH- 1;     REPORT JUST YESTERDAY'S DATA               03420299
                    1275         *EDATE=    LASTMONTH- 1;     END DATE FOR OUTPUT REPORTING              03420399
                    1276         *SDATE=    LASTWEEK+ 1;     REPORT JUST YESTERDAY'S DATA                03420499
                    1277         *EDATE=    LASTWEEK+ 2;     END DATE FOR OUTPUT REPORTING               03420599
                    1278         *SDATE=    TODAY-  1;     REPORT JUST YESTERDAY'S DATA                  03421099
                    1279         *SDATE=    LASTWEEK;      REPORT JUST LAST WEEK'S AVTIVITY              03430000
                    1280         *SDATE=    14FEB2018;     START DATE FOR OUTPUT REPORTING               03431099
                    1281         *STIME=    15:01;         START TIME FOR OUTPUT REPORTING               03440099
                    1282         *EDATE=    03APR2018;     END DATE FOR OUTPUT REPORTING                 03450099
                    1283         *ETIME=    21:33;         END TIME FOR OUTPUT REPORTING                 03451099
                    1284         *EDATE=    TODAY-  1;     REPORT JUST YESTERDAY'S DATA                  03460000
                    1285         *EDATE=    LASTWEEK;      REPORT JUST LAST WEEK'S AVTIVITY              03470000
                    1286         *                                                                      03481064
                    1287         *NOHOUR24;  ACTIVATE THIS PARAMETER, IF YOU DO NOT WANT TO CONVERT     03482099
                    1288         *           TIME 00:00 TO 24:00 OR THE PREVIOUS DAY                    03483066
                    1289         *           (IF YOU WANT TO USE THE PREVIOUS (OLD) STYLE).             03483166
                    1290         *           THE CONVERSION IS PERFORMED BY DEFAULT -                   03484066
                    1291         *           THE REPORTS ARE MORE ACCURATE IN THIS CASE                 03485066

COMPARSE (18104-08.54)       Line  Stmt   SYSCNTL control statements' source                run on 02MAY2018 04:48    Page  25
                    1292         *                                                                      03490037
                    1293         * IF YOU WANT TO LIMIT THE HOURFLAT TO A SUB-SET OF THE ENTIRE PERIOD. 03500038
                    1294         * THIS DATE SELECTION FOR HOURFLAT REQUIRES 25SEP13 OR LATER VEHSTATS.  03510038
                    1295  1151 +  HRSDATE=    12SES2017;     START DATE FOR HOURFLAT DAYS                03520099
                  Error --->      Incorrect control statement's operand(s).
                    1296         *HREDATE=    12SEP2017;     END DATE FOR HOURFLAT DAYS                  03521099
                    1297         *HRSDATE=    TODAY-  1;     REPORT JUST YESTERDAY'S DATA                03530037
                    1298         *HRSDATE=    LASTWEEK;      REPORT JUST LAST WEEK'S AVTIVITY            03540037
                    1299         *HREDATE=    TODAY-  1;     REPORT JUST YESTERDAY'S DATA                03560037
                    1300         *HREDATE=    LASTWEEK;      REPORT JUST LAST WEEK'S AVTIVITY            03570037
                    1301         *SELECTDOW= THR;          LIMITS HOURFLAT TO JUST THIS DOW             03580099
                    1302         *SELECTDOW= MON;          LIMITS HOURFLAT TO JUST THIS DOW             03581099
                    1303         *SELECTDOW= SAT;          LIMITS HOURFLAT TO JUST THIS DOW             03582099
                    1304         *                                                                      03590000
                    1305         *  SEE MEMBER, VEHDATES, FOR MORE DETAIL ON DATES                      03600000
                    1306         *                                                                      03610000
                    1307  1152 +  LINES= 999;  LINES= 999 TO PUT DAYSMRY & MONSMRY ON SINGLE PAGE BREAK 03620099
                    1308         *                                                                      03630000
                    1309         *     A MICRO CODE UPGRADE CHANGED THE SERIAL NUMBER BEING REPORTED.    03640000
                    1310         *      YOU CAN EITHER CHANGE THE OLD TO MATCH THE NEW OR THE NEW TO     03650000
                    1311         *      MATCH THE OLD VALUE.                                            03660000
                    1312         *DLSER= FRSER  TOSER;   CHANGE FROM ONE VALUE TO ANOTHER FOR REPORTS   03670000
                    1313         *                                                                      03680000
                    1314         *     THE INITIAL GRID SERIAL WAS BINARY 0, BUT APPEARED ON THE        03690000
                    1315         *      REPORTS AS A VALUE OF ?????.  YOU CAN CHANGE THE ????? TO THE   03700000
                    1316         *      NEW VALUE SO OLD AND NEW DATA WILL APPEAR AS THE SAME GRID.      03710000
                    1317         *GRIDSER= ????? TOSER;   CHANGE BINARY 0 TO NEW GRID SERIAL NUMBER     03720000
                    1318         *                    ;                                                 03730099
                    1319         *                                                                      03730199
                    1320         *SMFNUM =  94;   USER SELECTABLE SMF # FOR STATSMF DATA                03731099
                    1321         *VTSNUM = H1111;  CL1                                                  03740199
                    1322         *                 WITH FLAT FILES AND GRAPHING PACKAGE                 03750099

       Error ---> required control statement EXPIRE is missing or is invalid. Ensure program level is CURRENT or fix the error.
Parsing is completed.  1152 control statements are processed,     4 errors are detected. The program is terminated due to errors.
```

The SYSLIST protocol for the COMPARSE version before April 2018

The text marked in green is the file and page headers. The text marked in read is the text of error messages.

```
COMPARSE(17065)                    SYSCNTL PARAMETERS SPECIFIED FOR THIS EXECUTION
ERROR PARSING KEY PORTION OF RECORD  =>  EXPIRE=30NOV2017 100025666 ;
                                         *  USE OF THE EXPIRATION LOGIC IS SIMPLY A WAY OF ENSURING THAT USERS
                                         *    STAY RELATIVELY CURRENT WITH THEIR IBMTOOLS LIBRARIES.
                                         *  REVIEW THE UPDATES.TXT FILE ON THE FTP SITE TO SEE WHAT PROGRAM
                                         *    CHANGES HAVE BEEN MADE SINCE YOU LAST DOWNLOADED.
                                         *  THAT IS ALSO WHERE THE LATEST EXPIRE VALUE IS.
                                         *
                                         * THE ORDER STATEMENTS DETERMINE WHICH FIELDS WILL BE REPORTED IN THE
                                         *  DAYSMRY, MONSMRY, HOURFLAT, DAYHSMRY, AND WEKHSMRY REPORTS AND WHAT
                                         *  ORDER THEY WILL APPEAR IN.
                                         *  PICK AND CHOOSE FROM THIS LIST AND RE-ARRANGE TO FIT YOUR NEEDS.
                                         *
                                         *  IBMTOOLS.JCL(ORDERV12) IS THE DEFAULT MEMBER OR YOU CAN CREATE YOUR
                                         *   OWN MEMBER WITH YOUR FIELDS AND SEQUENCE.
                                         *
                                         *  THIS MEMBER, ORDERALL, IS FOR USE WHEN RUNNING VEHSTATS TO PRODUCE
                                         *     THE DAYHSMRY & HOURFLAT FLAT FILES.  INITIALLY SET FOR CL1,3,4,5
                                         *  USE THIS DEFAULT MEMBER OR CREATE YOUR OWN ORDER MEMBER FROM THESE
                                         *   DEFINED FIELDS.
                                        ***************** NEW FIELDS WILL BE ADDED OVER TIME ********************
                                        ************ FOR NOW THESE ARE THE ONES AVAILABLE ***********************
                                        ************************************************************************
                                         ORDER='    CODE LEVEL';   MICRO CODE LEVEL AT END OF INTERVAL (DA/MO)
                                         ORDER='DAYS W/ACTIVTY';   NUM DAYS WITH ACTIVITY FOR MONSMRY
                                         ORDER='    UTC OFFSET';   UTC OFFSET VALUE SPECIFIED
                                        *
                                         ORDER='SECTION:              ';            SECTION HEADING
                                         ORDER='SECTION:TS7700 CAPACITY';           SECTION HEADING
                                         ORDER='      TVC SIZE';  TOTAL TVC SIZE AVAILABLE
                                         ORDER='  ACTIVE LVOLS';  TOTAL ACTIVE LOGICAL VOLUMES
                                         ORDER='    ACTIVE GBS';  TOTAL ACTIVE GB OF DATA
                                         ORDER='     VV IN TVC';  NUMBER VIRTUAL VOLUMES IN TVC
                                         ORDER='     GB IN TVC';  AMOUNT OF VIRTUAL VOLUMES IN TVC (GB)
                                         ORDER='LVOLS ON TAPES';  NUMBER OF LOGICAL VOLUMES ON TAPES
                                         ORDER='   GB ON TAPES';  AMOUNT OF LOGICAL VOLUMES ON TAPES (GB)
                                         ORDER='  AVG CPU UTIL';  AVG CPU (PROCESSOR) UTILIZATION
                                         ORDER='  MAX CPU UTIL';  MAX CPU (PROCESSOR) UTILIZATION
                                        *
                                         ORDER='SECTION:              ';            SECTION HEADING
                                         ORDER='SECTION:VIRTUAL MOUNTS';            SECTION HEADING
                                         ORDER='      TOT MNTS';   TOTAL NUMBER OF VIRTUAL MOUNTS
                                         ORDER='       SCRATCH';   NUMBER SCRATCH MOUNTS
                                         ORDER='        RD HIT';   NUMBER OF READ HITS IN CACHE
                                         ORDER='       RD MISS';   NUMBER OF READ MISSES
                                         ORDER='   MOUNT HIT %';   HIT %
                                         ORDER='   AVG MNT SEC';   AVERAGE VIRTUAL MOUNT TIME IN SECONDS
                                         ORDER='AVG SCR MT SEC';   AVG SCRATCH MOUNT TIME IN SECONDS
                                         ORDER='AVG RD HIT SEC';   AVG READ HIT MOUNT TIME IN SECONDS
                                         ORDER='AVG RD MIS SEC';   AVG READ MISS MOUNT TIME IN SECONDS
                                         ORDER='          SYNC';   NUMBER SYNC MOUNTS
                                         ORDER='  AVG SYNC SEC';   AVG SYNC MOUNT TIME IN SECONDS
                                         ORDER=' MAX VIRT DRVS';   MAX VIRTUAL DRIVES CONCURRENTLY MOUNTED
                                         ORDER=' AVG VIRT DRVS';   AVG VIRTUAL DRIVES CONCURRENTLY MOUNTED
                                        *
                                         ORDER='SECTION:              ';            SECTION HEADING
.....................................................................................................................
                                   SYSCNTL PARAMETERS SPECIFIED FOR THIS EXECUTION
                                         ORDER='PG1 RDCP AGE 7';  PART. 7: PG1 REMOVED TIME DEL.COPIES AVER.AGE
                                         ORDER='PG1 RDCP LVL 7';  PART. 7: PG1 TIME DELAYED COPIES REMOVAL COUNT
                                         ORDER='TOT MGRTD GB 7';  PART. 7: TOTAL SIZE OF MIGRATED DATA
                                         ORDER='PG0 AVWTDLYV 7';  PART. 7: PG0 AVG WAIT TIME DELAYED VOLUMES
                                         ORDER='PG0 TOSZDVOL 7';  PART. 7: PG0 TOTAL SIZE VOLS W.TIME DELAY PRE.
                                         ORDER='PG0 NUMTDVOL 7';  PART. 7: PG0 RESIDENT VOLS W.TIME DELAY PREM.
                                         ORDER='PG0 UNMGVOLS 7';  PART. 7: PG0 UNMIGRATED VOLUMES
                                         ORDER='PG1 AVWTDLYV 7';  PART. 7: PG1 AVG WAIT TIME DELAYED VOLUMES
                                         ORDER='PG1 TOSZDVOL 7';  PART. 7: PG1 TOTAL SIZE VOLS W.TIME DELAY PRE.
                                         ORDER='PG1 NUMTDVOL 7';  PART. 7: PG1 RESIDENT VOLS W.TIME DELAY PREM.
                                         ORDER='PG1 UNMGVOLS 7';  PART. 7: PG1 UNMIGRATED VOLUMES
                                        *ORDER='   PGM VERSION';  PROGRAM VERSION CREATING THIS FILE
PARSING FOUND ERRS FOR INPUT RECORD ==>  OXXXX='    CODE LEVEL';   MICRO CODE LEVEL AT END OF INTERVAL (DA/MO)
                                        *ORDER='   PGM VERSION';  PROGRAM VERSION CREATING THIS FILE
                                        ************************************************************************
                                        *        FILL IN THE FOLLOWING RECORDS AS APPROPRIATE:                 *
                                        ************************************************************************
PARSING FOUND ERRS FOR INPUT RECORD ==>  CSSTOMSS=  TESTING BY AK    ;    1-50 CHAR
                                        *SPLITCLUSTERS;    SPLIT FLAT FILES BY CLUSTERS (HOURFLAT,
                                        *                                               DAYHSMRY, WEKHSMRY)
                                        *   YOU SIMPLY NEED TO ACTIVATE THE DD STATEMENTS YOU NEED.
                                        *    (THE MESSAGES IEC130I WILL NOT BE ISSUED).
                                        *
                                        *EUROFORMAT;    USE COMMA INSTEAD OF PERIOD FOR FRACTIONAL NUMBERS
                                        *DATEFORM= J;    DEFAULT FLAT FILE FORMAT IS DDMONYEAR
                                        *   USE THIS --> J=JULIAN, A=AMERICAN, E=EUROPEAN, OR I=ISO.
                                        *    TO GET ---> YEAR/DDD  MM/DD/YEAR  DD/MM/YEAR     YEAR/MM/DD
                                        *SINGLESPACE;  USE SINGLE SPACE BETWEEN FIELDS IN FLAT FILES
                                        *CSVDELIMITER= ',';  USE THIS DELIMITER BETWEEN FIELDS IN FLAT FILES
                                        *CSVDELIMITER= '|';  USE THIS DELIMITER BETWEEN FIELDS IN FLAT FILES
                                        *CSVDELIMITER= 'S';  USE THIS TO SPECIFY ; AS DELIMITER IN FLAT FILES
                                        *CSVDELIMITER= 'B';  USE THIS TO SPECIFY SPACE AS DELIMITER IN FLAT
                                        *                                                              FILES
                                        *ONEHEADING;   ONLY ONE HEADING ON FLAT FILES, NOT BETWEEN CLUSTERS
```

```
*NOFILLER;     DO NOT WRITE FILLR LINES TO DAYHSMRY
*SHOWVERSION;  WRITE ID HEADER TO HOURFLAT FILE
*PRIPOOL= 1 2 05;
*SECPOOL= 15 25;          DEFINE SECONDARY POOLS SO LVOLS DON'T GET
*                         COUNTED TWICE FOR ACTIVE_LVOLS FIELD
 QUEAGEMINUTES;  REPORT DEF & RUN QUEUE AGE AS MINUTES, NOT SECONDS
 USEGB;    FOR HOURFLOW, REPORT QUEUE AS GIB IF > THAN 999999 MIB
 REPORT= HRS;           HRS ROLL-UP, COMPARE, AND FLAT FILE SMRY
*REPORT= QTR;           HRS ROLL-UP, COMPARE, AND FLAT FILE SMRY
 REPORT= COM;           COMPARE
 REPORT= HDSUM;
 REPORT= HXFR;
 REPORT= DXFR;
 REPORT= FLOW;
*REPORT= GRID;
*REPORT= SHOP;
*      = QTR      REQUEST 15 MINUTE REPORTING AS GENERATED BY TS7740
*      = HRS      REQUEST HOURLY ROLL-UP REPORTING
*      = FLOW     REQUEST DATA FLOW BY CLUSTER - CAN'T USE WITH GRID
*      = GRID     SUMMARIZES ALL CLUSTERS BY GRID - CAN'T USE W/FLOW
*      = SHOP     SUMMARIZES ALL CLUSTERS WITHIN SHOP
*      = COMPARE  REQUEST SIDE BY SIDE CLUSTER COMPARISON
*      = HDSUM    DAILY SUMMARY FLAT FILE - HORIZONTAL 1 DAY/LINE
*      = HXFR     FOR HOURLY ON DEMAND TRANSFER REPORTING
*      = DXFR     FOR DAILY ON DEMAND TRANSFER REPORTING
*UTCMINUS= 07;     ADJUST UTC TO LOCAL TIME WEST OF GREENWICH
SYSCNTL PARAMETERS SPECIFIED FOR THIS EXECUTION
*UTCPLUS=  01;     ADJUST UTC TO LOCAL TIME EAST OF GREENWICH
*
*  SEE MEMBER, VEHDATES, FOR MORE DETAIL ON DATES
*
*      DEFAULT SDATE/EDATE ARE 01JAN1995/01JAN2035
*SDATE=    THISMONTH- 1;     REPORT JUST YESTERDAY'S DATA
*EDATE=    THISMONTH;        END DATE FOR OUTPUT REPORTING
*SDATE=    LASTMONTH- 1;     REPORT JUST YESTERDAY'S DATA
*EDATE=    LASTMONTH- 1;     END DATE FOR OUTPUT REPORTING
*SDATE=    LASTWEEK+ 1;     REPORT JUST YESTERDAY'S DATA
*EDATE=    LASTWEEK+ 2;     END DATE FOR OUTPUT REPORTING
*SDATE=    TODAY-  1;      REPORT JUST YESTERDAY'S DATA
*SDATE=    LASTWEEK;       REPORT JUST LAST WEEK'S AVTIVITY
*SDATE=    25OCT2017;      START DATE FOR OUTPUT REPORTING
*STIME=    19:25;          START TIME FOR OUTPUT REPORTING
*EDATE=    30SEP2017;      END DATE FOR OUTPUT REPORTING
*ETIME=    00:17;          END TIME FOR OUTPUT REPORTING
*EDATE=    TODAY-  1;      REPORT JUST YESTERDAY'S DATA
*EDATE=    LASTWEEK;       REPORT JUST LAST WEEK'S AVTIVITY
*
*NOHOUR24;  ACTIVATE THIS PARAMETER, IF YOU DO NOT WANT TO CONVERT
*           TIME 00:00 TO 24:00 OR THE PREVIOUS DAY
*           (IF YOU WANT TO USE THE PREVIOUS (OLD) STYLE).
*           THE CONVERSION IS PERFORMED BY DEFAULT -
*           THE REPORTS ARE MORE ACCURATE IN THIS CASE
*
* IF YOU WANT TO LIMIT THE HOURFLAT TO A SUB-SET OF THE ENTIRE PERIOD.
* THIS DATE SELECTION FOR HOURFLAT REQUIRES 25SEP13 OR LATER VEHSTATS.
*HRSDATE=    12SEP2017;     START DATE FOR HOURFLAT DAYS
*HREDATE=    12SEP2017;     END DATE FOR HOURFLAT DAYS
*HRSDATE=    TODAY-  1;     REPORT JUST YESTERDAY'S DATA
*HRSDATE=    LASTWEEK;      REPORT JUST LAST WEEK'S AVTIVITY
*HREDATE=    TODAY-  1;     REPORT JUST YESTERDAY'S DATA
*HREDATE=    LASTWEEK;      REPORT JUST LAST WEEK'S AVTIVITY
*SELECTDOW= FRI;          LIMITS HOURFLAT TO JUST THIS DOW
*
*  SEE MEMBER, VEHDATES, FOR MORE DETAIL ON DATES
*
 LINES= 999;  LINES= 999 TO PUT DAYSMRY & MONSMRY ON SINGLE PAGE BREAK
*
*     A MICRO CODE UPGRADE CHANGED THE SERIAL NUMBER BEING REPORTED.
*      YOU CAN EITHER CHANGE THE OLD TO MATCH THE NEW OR THE NEW TO
*      MATCH THE OLD VALUE.
*DLSER= FRSER  TOSER;   CHANGE FROM ONE VALUE TO ANOTHER FOR REPORTS
*
*     THE INITIAL GRID SERIAL WAS BINARY 0, BUT APPEARED ON THE
*      REPORTS AS A VALUE OF ?????.  YOU CAN CHANGE THE ????? TO THE
*      NEW VALUE SO OLD AND NEW DATA WILL APPEAR AS THE SAME GRID.
*GRIDSER= ????? TOSER;   CHANGE BINARY 0 TO NEW GRID SERIAL NUMBER
 SMFNUM = 194;   USER SELECTABLE SMF # FOR STATSMF DATA
*VTSNUM = 28C9P;  SELECT JUST THIS CLUSTER TO MAKE IT EASIER TO WORK
*VTSNUM = 394DT;  SELECT JUST THIS CLUSTER TO MAKE IT EASIER TO WORK
*                 WITH FLAT FILES AND GRAPHING PACKAGE
*
ERROR===> REQUIRED CONTROL STATEMENT (EXPIRE=) IS MISSING OR IS INVALID. ENSURE PROGRAM LEVEL IS CURRENT, OR CORRECT THE STMNT.
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