Free GiAPA Performance Analysis

A step-by-step guide:

		Estimated manpower minutes
1.	Download GIAPA from https://www.giapa.com/giapa.zip	5
2.	Email sales@giapa.com to request UNZIP password	5
3.	Install GiAPA (Unzip, download save file, restore GIAPALIB)	10
4.	Review authorities needed for data collection	10
5.	Start GiAPA data collection (run max. 72 hours)	5
6.	End GiAPA performance data collection	5
7.	Send Email to sales@giapa.com requesting password	5
8.	Run the automatic performance Analysis	5
9.	Display examples of optimization hints	10
		60

Business Partner IBM

Is GiAPA Safe to Run on Our Server?

GiAPA never

- copies or opens customer files or accesses customer data
- modifies an operating system value or parameter
- calls customer programs (exception: user exit programs defined to GiAPA)

GiAPA users over the past decades include major banks, insurance and logistics companies and large corporations – please see “References” on www.giapa.com.

iPerformance ApS has been an IBM Business Partner since 2003.

APIs called by GiAPA:

```
QBNLPGMI QCMDEXC  QDMLOPNF QLICOBJD QLZARTV  QMHRMVPM QMHSNDM  QMHSNDPM
QPMLPFRD QPMWKCOL QSZRTVPR QUSADDUI QUSCHGUS QUSCMDLN QUSCRTUI QUSCRTUQ
QUSCRTUS QUSCUSAT QUSLFLD  QUSLJOB  QUSLOBJ  QUSLRCD  QUSPTRUS QUSRJOBI
QUSRMBRD QUSRMVUI QUSROBJD QUSRTVUI QUSRTVUS QUSRUIAT QUSRUSAT QWCCVTDT
QWCOLTHD QWCRDTAA QWCRSSTS QWCRSVAL QWVRCSTK QZLSADFS QZLSCHFS QZLSOLST
```

Authority Needed to Collect Performance Data

GiAPA calls the performance data collector APIs **QPMLPFRD** and **QPMWKCOL**. These two objects are shipped by IBM with public authority *EXCLUDE.

If Job Accounting is active, GiAPA runs CL command **RCVJRNE** to obtain job start and end time from the QACGJRN journal receiver.

The GiAPA data collection job must have authority to use these objects. This can be achieved in two ways:

1. **Using adopted authority for data collection**

   GiAPA's data collection programs GIAPA111, GIAPA112 and GIAPA113 are shipped with authority adopted from QSECOFR. When restoring GIAPALIB, sign on using a profile having QSECOFR authority and with the system value QALWOBJRST allowing a restore of programs using adopted authority.

2. **Run data collection under a user profile having sufficient authority.**

   GIAPALIB may be restored using a profile without QSECOFR authority. In this case the data collection job must run under a user profile having authority to call the QPMLPFRD and QPMWKCOL APIs and to read the job accounting journal.

GiAPA Menu option 89 shows if authorization is sufficient for GiAPA data collection.

Installation of GiAPA

1. Download the password protected zipped file named giapa.zip from
   https://www.giapa.com/giapa.zip

2. Unzip the file on your PC using the password received from your GiAPA sales representative. The zipped file contains
   - library GIAPALIB in save file **giapalib.savf**
   - The GiAPAmanual, and our sales “Terms and Conditions”.

3. Transfer in binary mode the unzipped **giapalib.savf** to an already existing *SAVF on your Server.

4. Install GiAPA by running the command

   ```
   RSTLIB SAVLIB(GIAPALIB) DEV(*SAVF) SAVF(mysavefile)
   ```

GIAPALIB Backup Considerations

Given the <0.1% CPU usage most users allow GiAPA data collection to run 24/7, i.e. GiAPA remains active even when backups are running.

Most backup software automatically includes any new libraries, using a “save while active” technique for data bases.

To avoid object lock conflicts during the backup, please specify that the GIAPALIB objects type *USRIDX and *USRSPC must be excepted from being backed up.

For a SAVLIB command this is handled by using the OMITOBJ keyword:

OMITOBJ((GIAPALIB/*ALL *USRSPC) (GIAPALIB/*ALL *USRIDX))

GiAPA
by iPerformance

CL-command GIAPALIB/GIAPA displays the GiAPA Menu

```
GiAPA (c) by iPerformance        GiAPA V06M00          GiAPA Menu          POWER720 on 06E84CT LPAR 00001     KAARE

   DATA COLLECTION AND ANALYSIS                IBM PERFORMANCE EXPLORER                EXPORT AND IMPORT GIAPA DATA
11 Submit performance data collection    31 Start PEX statistics data collection   71 Export GiAPA raw performance data
12 HotSpot watch of one selected job     32 End PEX statistics data collection     72 Export GiAPA analysis results
13 End performance data collection       33 List call stack based on PEX data      73 Import GiAPA raw data or results
14 Expand and analyze collected data

                                            DETAILED JOB TRACE                      INSTALLATION PARAMETERS
   DISPLAY/PRINT RESULTS                 41 Start trace of job                    74 Define loop trap exceptions
15 Job performance summary reports       42 End trace of job                      75 HotSpot and Optim.Hint exceptions
16 Reports on *ALL data (when kept)      43 Analyze trace job data                76 Maintain color palettes for graphics
17 Job or user name summary                                                       78 Installation parameters
18 HotSpot count summaries                  DATA BASE UTILITIES
19 Program and file performance analysis 51 Collect file check data               HOUSEKEEPING
20 Program and file optimization hints   52 Run file check analysis reports       81 Manage unexpanded pfr.data members
21 Collection interval summaries         53 List index generations                82 Manage expanded data members
22 File analysis based on HotSpots                                                83 Delete Performance Explorer data
23 Jobs having priority modified            TRACK USE OF SQL AND QUERY            84 Delete trace job data
24 CPU usage per current user            61 Start SQL Plan Cache collection       85 Delete file check data
                                         62 Display collected Plan Cache data     87 Delete RUNQRY/WRKQRY tracking data
   GiAPA GRAPHICS                        63 Stop Plan Cache data collection       89 Check if authority OK for pfr.coll.
26 User defined charts                   64 Start RUNQRY and WRKQRY tracking
28 Work with created charts              65 End RUNQRY and WRKQRY tracking        98 Display server attributes
                                         66 List RUNQRY and WRKQRY usage          99 Display GiAPA Command Menu

F2=Cmd.Line   F3=Exit        Licence code type: L        Select option:            Data library: GIAPALIB
                                                                    (C) Copyright iPerformance ApS, Denmark, 2003, 2024.
```

Starting GiAPA Data Collection

Use GiAPA Menu option 11; keep all default options.

```
                    Submit performance collection (GIAPA110)

Type choices, press Enter.

Minutes to collect data  . . . . MINUTES        *NOMAX
Store output data in library . . DATALIB      > GIAPALIB
HotSpot CPU pct limit / 15 sec   CPULIMIT       4.0
Collect pgm + file usage data?   HOTSPOTS       *YES
Days after which data deleted  . DLTAFTER       *KEEP
```

This command will submit several jobs – typically 4 plus 2 more for each additional CPU active in the LPAR.

GiAPA's total CPU usage is typically less than 0,1 % despite collecting data for all active jobs on the server.

To verify that GiAPA is collecting data you may use menu option 81, which also displays the size of the data collected. A new data base member is normally created every day.

Ending GiAPA Data Collection

Use GiAPA Menu option 13 to termintate the data collection.

```
                        Terminate GiAPA Collection (GIAPA130)

Type choices, press Enter.

Stop GiAPA data collection?  . . TERMINATE      Y
```

Please note:
Do NOT end GiAPA data collection using an ENDJOB command!

The ENDJOB command will result in some data loss since GIAPA will be prevented from consolidating all data collected into one member.

Running the Performance Data Analysis

When data has been collected, contact your GiAPA sales representative and **request the security code needed to run the analysis**.

The expansion and analysis of the collected performance data is

- for GiAPA the most complex part of a Free Trial
- for the user the least complex part to run:

Simply select option 14 from the GiAPA Menu !

This will result in submission of batch job GIAPAEXPAN that will run a few minutes, depending on how much data was collected.

Please note:

- expansions run with priority 59 to avoid disturbing other jobs
- ***a FreeTrial only allows one analysis/expansion,*** *therefore please terminate all data collections prior to running expansion/analysis.*

Request a Free Temporary GiAPA Security Code

When data has been collected, contact your GiAPA sales representative and request the security code needed to run the analysis. It will be sent together with installation instructions → showing the command to run.

Use GiAPA Menu option 98 to get serial number, LPAR number, and current number of processors (needed when requesting the GiAPA security code).

```
GiAPA (c) by                Performance Related              Sys.Name POWER720
iPerformance          Hardware and Software Attributes       25-07-02 18:29:06

Serial Number.................: 06E84CT                 System Values
LPAR number...................:     1                    QDYNPTYADJ..: *On
System type and model.........: 8202 E4D    720         QDYNPTYSCD..: *On
Operating system version......: V7R3M0                  QPFRADJ.: 2 = IPL + Auto
Software processor group......: P05     70 PVU/CPU      QPRCMLTTSK..: Syst.Ctrl.
Processor feature.............: EPCK                     QQRYDEGREE..: *MAX
Current number of partitions.:   1                       QQRYTIMLMT..: *NOMAX
Primary partition identifier.:   0
Partition sharing processors.:  NO                      GiAPA version V06M01H
                                                        GiAPA license type: G
Total auxiliary storage in MB:      418,759             GiAPA security code:
System ASP:      418,759    % used:  48.408             D48B044876438C70492108

                                          Current       Minimum       Maximum
Number of virtual processors..........:         1             1             4
Configured memory in megabytes........:     15488           320         16384
Percentage interactive work...........:       100             0           100
Processing capacity...................:      1.00          1.00          4.00
```

Running the Performance Data Analysis

The expansion and analysis of the collected performance data is

- for GiAPA the most complex part of a Free Trial
- for the user the least complex part to run:

  Simply select option 14 from the GiAPA Menu !

```
GiAPA (c) by     Submit job to expand collected performance data        25-07-02
iPerformance                                                           18:14:28
                                Output member name: FREETRIAL   YYMMDD Select hhmm
 1=Include in expansion         Keep detailrecords? *NO         000101  From  0000
 5=Display mbr statistics       Delete output after 9999 days   991231   To   2359
                                Optional text:  Free GiAPA Analysis of Pfr.Data
Opt   Member       Date         Text
 1    PF05010002   250617       Pfr.data from 250501 at 000200
 1    PF04310002   250702       Pfr.data from 250431 at 000157
```

This will result in submission of batch job GIAPAEXPAN that will run a few minutes, depending on how much data was collected.

Please note:

- expansions run with priority 59 to avoid disturbing other jobs
- ***a FreeTrial only allows one analysis/expansion,*** *therefore please terminate all data collections prior to running expansion/analysis.*

Requesting the Results of the Analysis

When job GIAPAEXPAN (expansion and analysis) is terminated, please use GiAPA Menu option 20 to display this panel:

```
GiAPA (c) by        Select input member for generation of          21-04-26
iPerformance    Optimization Hints for Programs and File Access    10:37:11
                          Data Library: GIAPALIB

Select (generic) pgm or file *ALL          Show savings exceeding 001 minutes

Select between two output formats
Show in HTML window:  1=All results   2=Program hints   3=File access hints
Use 5250:  4=Totals   5=All results   6=Program hints   7=File access hints

Opt  Member      Date        Text
 _   FREETRIAL   210426      Free GiAPA analysis of performance data
```

Select option 4 to check the total potential savings found.

Select option 1 to check the results for both programs and files, stored in the IFS as /GIAPA/GIAPA20.html.

Option 4: Total Tally for Potential Savings

Displayed together with data collection statistics and server data

```
GiAPA (c) by                  Statistics from Automated Application Performance Analysis   21-04-25
iPerformance                          Library GIAPALIB       Member FREETRIAL              17:52:54

       11,501 data collection intervals processed = data from 1 days 23 hours 55 minutes
21-04-20  0:02 date and time for first data included in analysis (YY-MM-DD hh:mm)
21-04-21 23:58 date and time for last data included in analysis  (YY-MM-DD hh:mm)
    75,934,744 job and task records received from Performance Collector API
    13,911,316 showed resource usage --> record generated
       121,402 different jobs and tasks found in API data
       123,580 HotSpots detected (Job exceeded interval limits)
       130,728 program call stacks retrieved
     1,589,244 program names processed
    10,207,356 open file data records processed

   Potential Savings Found by Automated Application Performance Analysis

       19     Improvements of Program Functions          1,158 Minutes

       11     Improvements of File Access Method           346 Minutes

          *** Total Potential Run Time Savings     25 Hours 04 Minutes

F3=Exit
```

```
Source machine specifications:
GiAPA version          V05M00
System name            MAINSERV
Serial number          713FD78
Processor type         EPT7
Model & Server Model   E8D
Price group            P20
Op.System version      V7R3M0
LPAR number              3
Number of LPARs          4
Nbr of Phys. CPUs        8
Procesor capacity        7.50
PVU per processor        0
Available memory Mb    210,239,488
Auxiliary storage Gb    30,342,937
System ASP Gb           30,342,937
System ASP use pct          71.3929
```

For Free Trial runs you obtain the results indicating the 3rd best savings
→ Details for top 2 savings (Optimization Hints # 1 and 2) are not shown.

If selection 1 = HTML format does not automatically display the output below,
please use selection 5 = 5250 “Green Screen” format to obtain the same data, or use
e.g. “IBM i Access Client Solutions” to see the results in html format in the IFS folder /GIAPA.

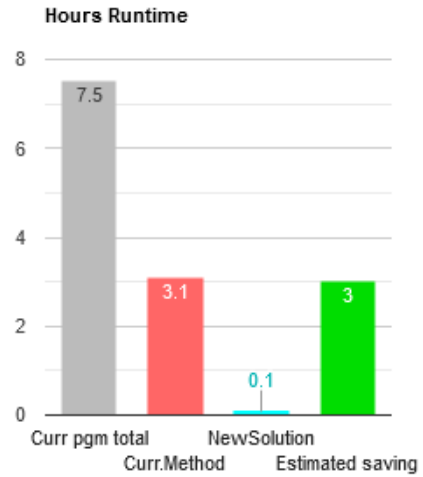
GiAPA
by iPerformance

Program Optimization Hint

47.9 hours of data collected starting 2021-04-20 at 00:01

System: MAINSERV
713FD78 LPAR 003

Program used	Library/Program not shown	Program optimization suggestion nbr. 1
Statement number	00000	
GiAPA detected	Description of potential performance improvement was suppressed ---	
Job and user	--- --- --- ---	
Estimated saving	---	
Effort required	Probably < 3 hours programmer time (test not included)	



Technical explanation

Tips on how to optimize the performance

Print all pages Print page

Automatically Generated Program Optimization Hint

(Based on test data received from a customer site)

Names of all jobs, users, user libraries and programs have been pseudonymized

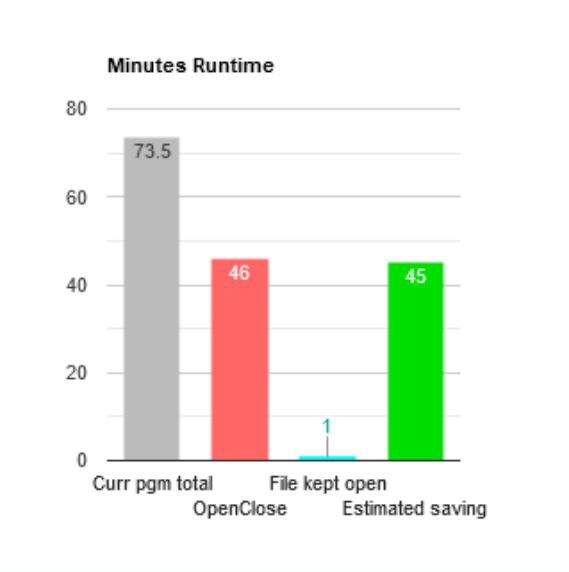
GiAPA by iPerformance

Program Optimization Hint

47.9 hours of data collected starting 2021-04-20 at 00:01

System: MAINSERV
713FD78 LPAR 003

Program used	ATMPROD/EM0764	I/O subprogram for accessing ATM records
Statement number	766 1000001	
GiAPA detected	File opening or closing routine found in 184 HotSpots	
Job and user	ATMTRANS NIGHTPROD ATMVALID NIGHTPROD	
Estimated saving	97 % of OPENCLOSE = 45 minutes run time	
Effort required	Probably < 3 hours programmer time (test not included)	



Technical explanation

Opening a file is slow, but paves the road for subsequent efficient I/O. Closing is less expensive, but also worthwile minimizing

Tips on how to optimize the performance

To open and close files frequently is rather expensive. A "full open" creates an ODP (Open Data Path) which is a temporary object containing tailored code optimized to ensure efficient I/O. Programs using many I/Os will therefore perform efficiently whereas the time used by creating an ODP will cause significant overhead if the file is closed (= ODP deleted) after each I/O. QDBOPEN and QDBCLOSE creates / deletes an ODP, respectively. QDMCOPEN and QDMCLOSE are the Data Management Common Open/Close routines that will call the program to open/close a data base file, a save file, a device file, etc. QDBSOPEN/QDBSCLOSE are the shared open/close routines that only attach/detach the program to/from an existing ODP and therefore use significantly less resources.

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Automatically Generated Data Base Access Optimization Hint

GiAPA detected that a given file accessed in arrival sequence was read one record at the time instead of in blocks

GiAPA by iPerformance

File Access Optimization Hint

System: MAINSERV
713FD78 LPAR 003

47.9 hours of data collected starting 2021-04-20 at 00:01

File accessed	QTEMP/GHETR211 *** File not found ***
Records in file	5,002,664 (Estimate based on records accessed)
GiAPA detected	27,502,722 sequential reads of next record found in 150 HotSpots
Job and user	RKSMTDEE CJMUNCK (2 jobs) RKSMTDEE LSPEDDIE (2 jobs) RKSM_2302 CJMUNCK
Estimated saving	27 minutes run time (mainly CPU time)
Effort required	Probably < 4 man-hours (test time not included)

Technical explanation

Always avoid reading records/rows one by one if accessing the data in "arrival sequence" (= as the are stored)

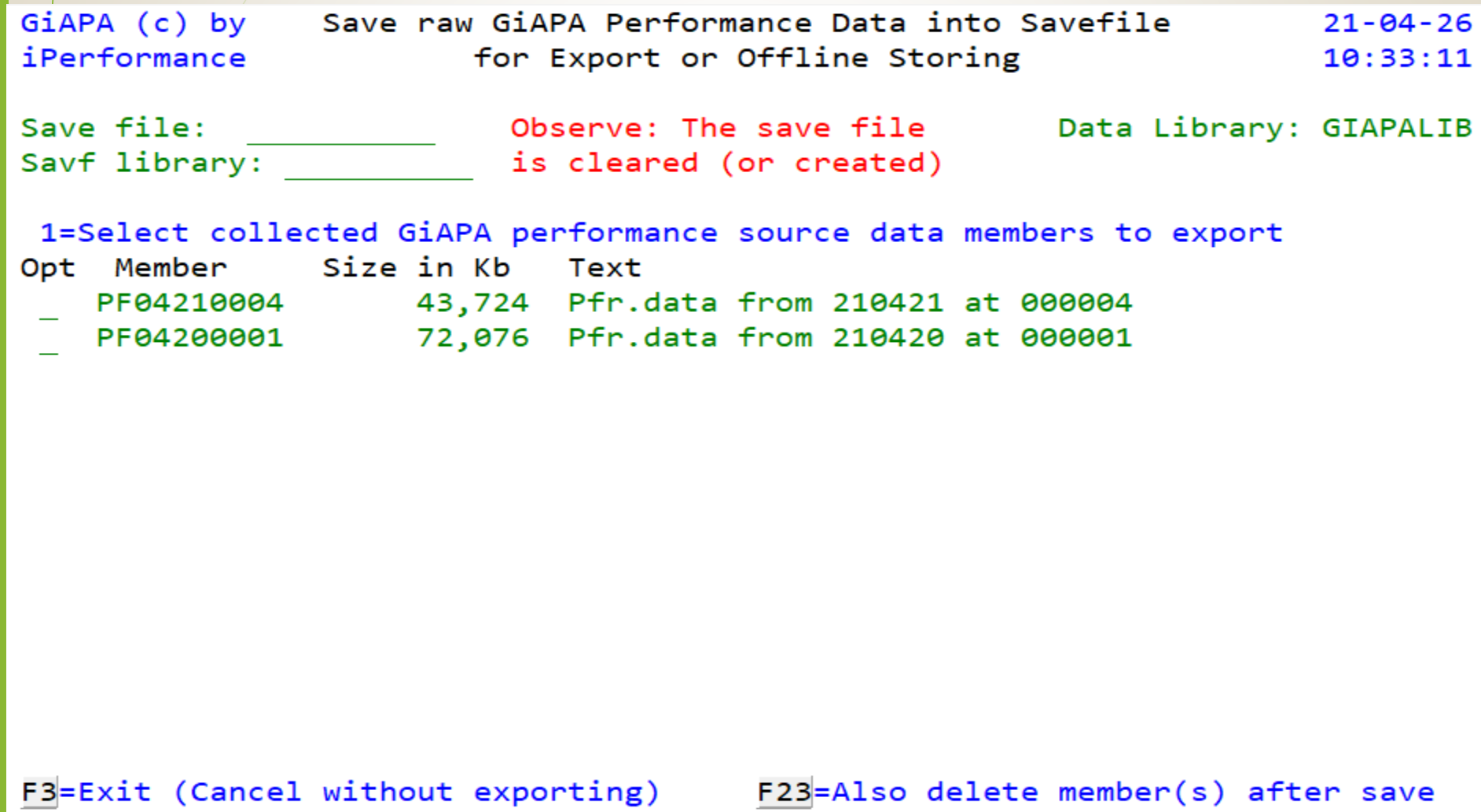
Tips on how to optimize the performance

Reading records one at the time is obviously much less efficient than if data base management can pass e.g. 100 records to the program in one block. However, before forcing blocked access we must also know if the records are stored in the sequence in which we want to read them. Access may be in a logical sequence (e.g. orders in customer number sequence), but if our order file actually is stored in chronological order we might decrease performance by forcing blocked access. Please note, that if a file only is read, it must be opened for input only to obtain blocked access. There are too many rules of the game to cover here - please refer to the first 10 slides in Tutorial 14 on www.giapa.com.

Print all pages Print page

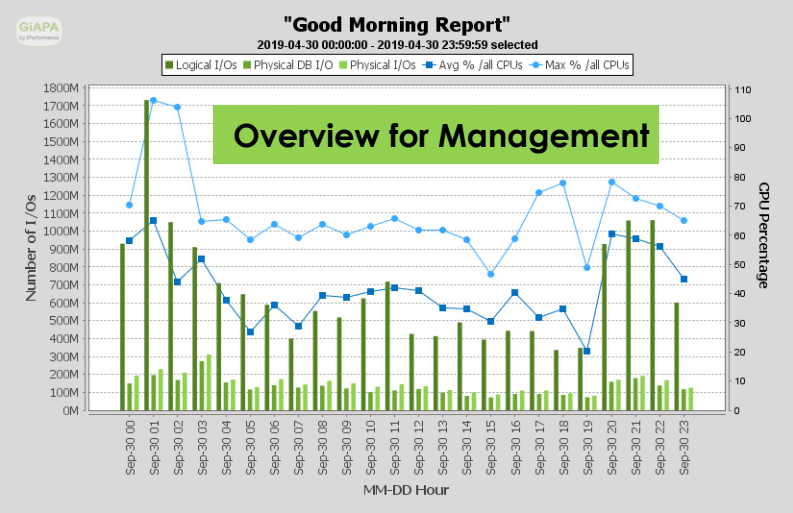
GiAPA Menu Option 71

Displays the data base members containing collected performance data, and facilitates saving the data to a save file in case the data needs to be uploaded to the iPerformance WebServer for additional analysis.



GiAPA has so much more to offer …

… the “Free GiAPA Performance Analysis is just “the tip of the iceberg”



Resource usage trends per application for management

Warning to operator:
Job XYZ is looping

Warning to operator:
Excessive memory allocation by Job ABC slows down the entire LPAR

Quality Control Tool for Development

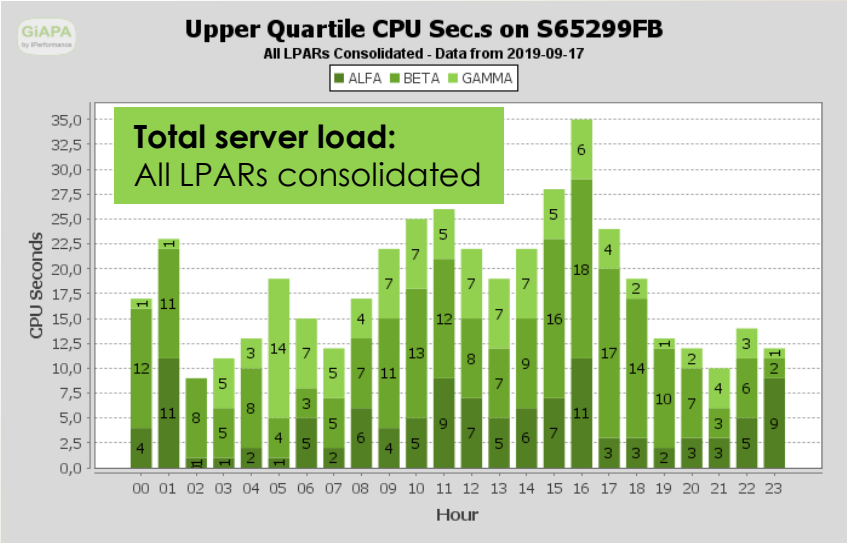
Performance analysis details to program source line

Operations tool

Timing & purpose of resource usage:

who – when – what – how much

Graphics and statistics of usage and trends



Please check our GiAPA Product Presentation Video:

https://www.giapa.com/GiAPA2021Presentation%20(Published)/

For more Information: Please visit www.giapa.com