Free GiAPA Performance Analysis

A step-by-step guide:

		Estimated manpower minutes
1.	Download the GIAPALIB save file	10
2.	Install the GiAPA software product	15
3.	Start the GiAPA performance data collection (allow data collection to run e.g. 72 hours)	3
4.	End the GiAPA performance data collection	3
5.	Send Email to request password	10
6.	Run the automatic performance Analysis	4
7.	Display examples of optimization hints	5
		52

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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 decade 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**.

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

These three objects are shipped by IBM with public authority *EXCLUDE.

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**
   - GiAPAmanual.pdf.

3. Transfer the unzipped **giapalib.savf** to an already existing *SAVF on
   your Server (if you use FTP: Remember BINary mode).

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 backup please specify the GIAPALIB objects type *USRIDX and *USRSPC as exceptions during backup.

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

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

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
11 Submit performance data collection
12 HotSpot watch of one selected job
13 End performance data collection
14 Expand and analyze collected data

DISPLAY/PRINT RESULTS
15 Job performance summary reports
16 Reports on *ALL data (when kept)
17 Job or user name summary
18 HotSpot count summaries
19 Program and file performance analysis
20 Program and file optimization hints
21 Collection interval summaries
22 File analysis based on HotSpots
23 Jobs having priority modified
24 CPU usage per current user

GiAPA GRAPHICS
26 User defined charts
28 Work with created charts

IBM PERFORMANCE EXPLORER
31 Start PEX statistics data collection
32 End PEX statistics data collection
33 List call stack based on PEX data

DETAILED JOB TRACE
41 Start trace of job
42 End trace of job
43 Analyze trace job data

DATA BASE UTILITIES
51 Collect file check data
52 Run file check analysis reports
53 List index generations

TRACK USE OF SQL AND QUERY
61 Start SQL Plan Cache collection
62 Display collected Plan Cache data
63 Stop Plan Cache data collection
64 Start RUNQRY and WRKQRY tracking
65 End RUNQRY and WRKQRY tracking
66 List RUNQRY and WRKQRY usage

EXPORT AND IMPORT GIAPA DATA
71 Export GiAPA raw performance data
72 Export GiAPA analysis results
73 Import GiAPA raw data or results

INSTALLATION PARAMETERS
74 Define loop trap exceptions
75 HotSpot and Optim.Hint exceptions
76 Maintain color palettes for graphics
78 Installation parameters

HOUSEKEEPING
81 Manage unexpanded pfr.data members
82 Manage expanded data members
83 Delete Performance Explorer data
84 Delete trace job data
85 Delete file check data
87 Delete RUNQRY/WRKQRY tracking data
89 Check if authority OK for pfr.coll.

98 Display server attributes
99 Display GiAPA Command Menu

F2=Cmd.Line   F3=Exit   Licence code type: L   Select option: ▮   Data library: GIAPALIB

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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 71, which also displays the size of the data collected. To this end, a new data base member is created every day.

Ending GiAPA Data Collection

Use GiAPA Menu option 13.

```
                    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 prohibited from consolidating all data collected into one member.

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

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 …AND

- 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 five to 20 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

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

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

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 reach the result in the IFS folder /GIAPA.

GiAPA
by iPerformance

Program Optimization Hint

System: MAINSERV
713FD78 LPAR 003

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

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)	

Hours Runtime

8

7.5

6

4

3.1   3

2

0.1

0

Curr pgm total   NewSolution
      Curr.Method   Estimated saving
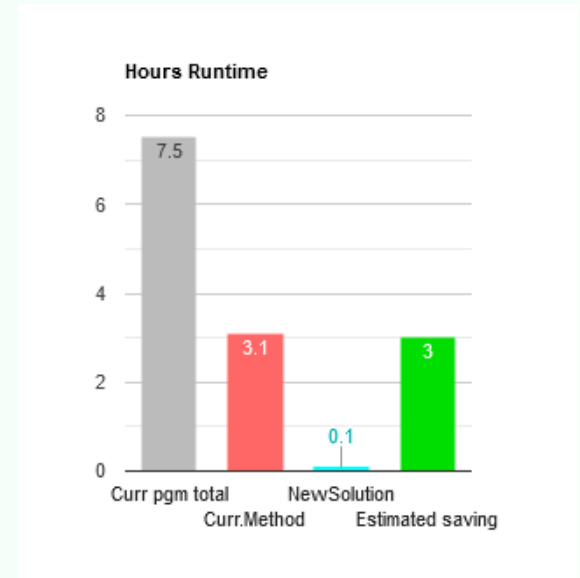
Technical explanation

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

System: MAINSERV
713FD78 LPAR 003

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

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)

Minutes Runtime

- Curr pgm total: 73.5
- OpenClose: 46
- File kept open: 1
- Estimated saving: 45
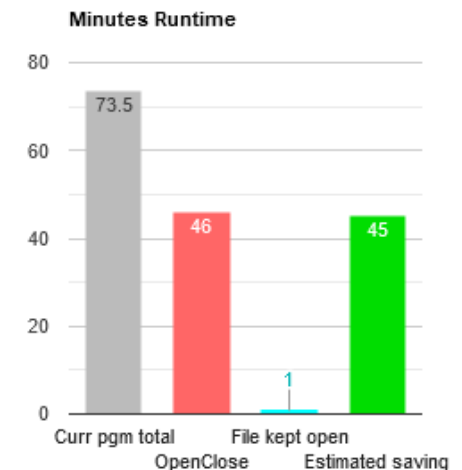
Technical explanation

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.

Print all pages   Print page

Optimization Hint for Data Base Access

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

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)

Minutes Runtime

Unblocked reads: 32.2
Blocked reads: 5.2
Estimated saving: 27
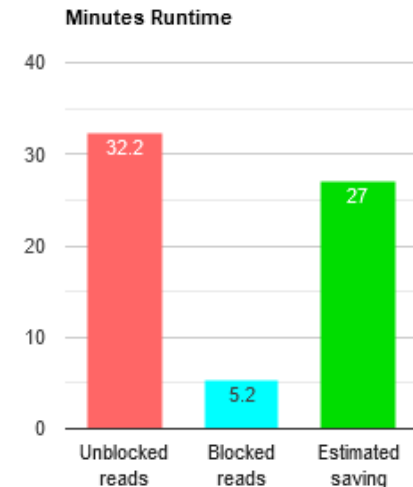
Technical explanation

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 (c) by        Save raw GiAPA Performance Data into Savefile      21-04-26
iPerformance             for Export or Offline Storing                 10:33:11

Save file:    _____      Observe: The save file      Data Library: GIAPALIB
Savf library: _____      is cleared (or created)

 1=Select collected GiAPA performance source data members to export
Opt  Member        Size in Kb    Text
 _    PF04210004        43,724   Pfr.data from 210421 at 000004
 _    PF04200001        72,076   Pfr.data from 210420 at 000001




F3=Exit (Cancel without exporting)      F23=Also delete member(s) after save
```

GiAPA Menu Option 98

Displays the below panel indicating various server and software specifications often needed for ordering security codes from software suppliers etc.

```
GiAPA (c) by              Performance Related         Sys.Name POWER720
iPerformance           Hardware and Software Attributes   21-04-25 13:28:22


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 V05M00
                                                    GiAPA license type: A
Total auxiliary storage in MB:     418,759          GiAPA security code:
System ASP:      418,759    % used:  67.055         3A260A367A2FE015230B46


                                       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


F3=Exit
```
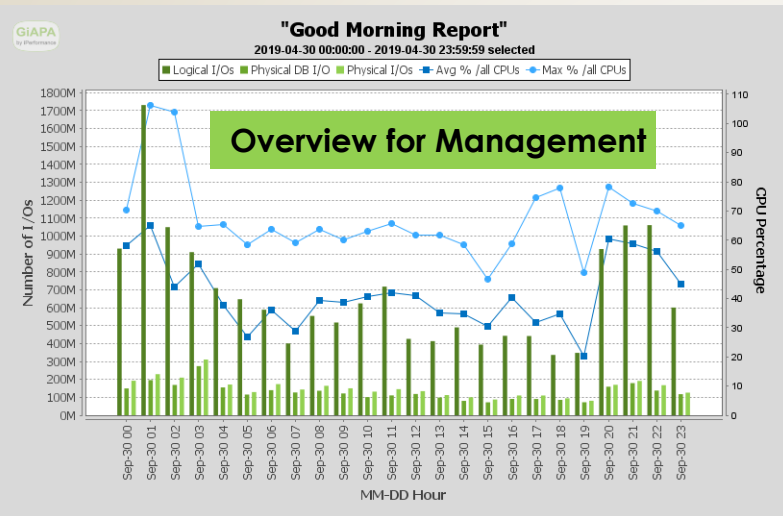
GiAPA has so much more to offer …

… the "Free GiAPA Performance Analysis is just "the tip of the iceberg"

"Good Morning Report"
2019-04-30 00:00:00 - 2019-04-30 23:59:59 selected

Overview for Management
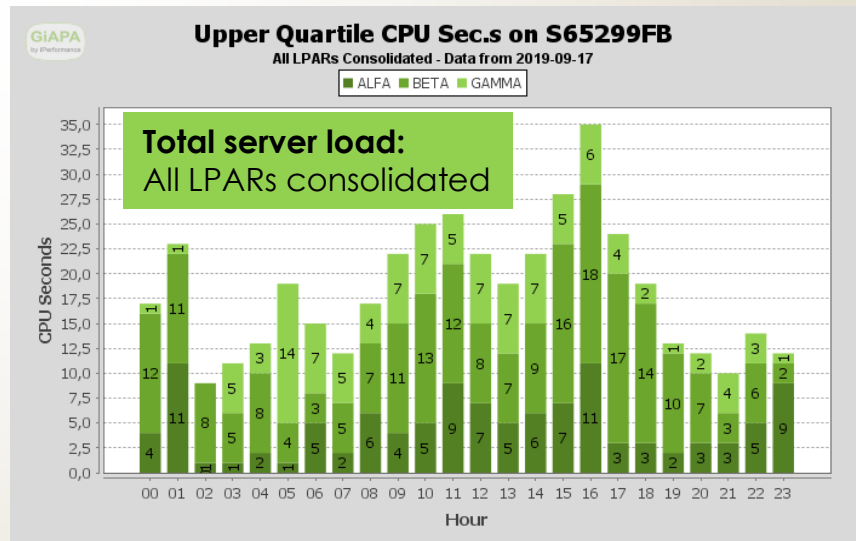
Resource usage trends per application for management

Warning to operator:
Job XYZ is looping

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

GiAPA "X-Rays" All Jobs !
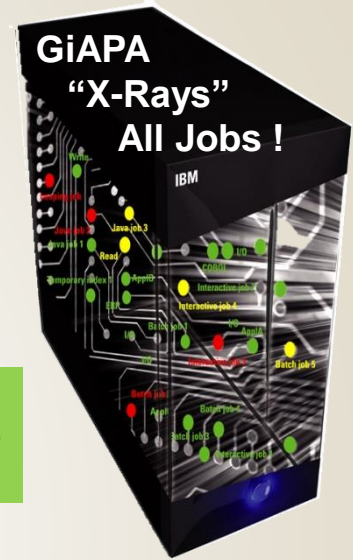
Quality Control Tool for Development
Performance analysis details to program source line

Operations tool
Timing & purpose of resource usage:
who – when – what – how much
Graphics and statistics of usage and trends

Upper Quartile CPU Sec.s on S65299FB
All LPARs Consolidated - Data from 2019-09-17

Total server load:
All LPARs consolidated

Please check our GiAPA Product Presentation Video:
https://www.giapa.com/GiAPA2021Presentation%20(Published)/

For more Information: Please visit www.giapa.com