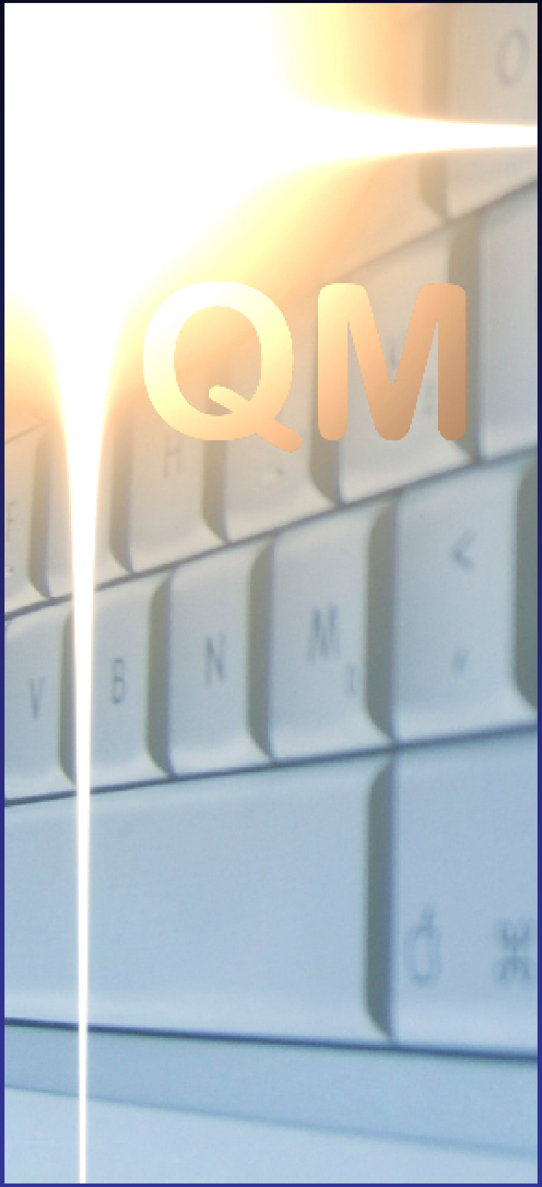


OpenQM

Configuration and Performance Optimisation

Martin Phillips
Ladybridge Systems Ltd

What We Are Going To See Today....

Installation overview

Permissions

Configuration Parameters – What they do

Ways to Optimise Application Performance

Installation Overview

QM is installed from a self-extracting archive

All installed components go in the QMSYS account directory

Default location for QMSYS is

```
C:\QMSYS      (Windows)
/usr/qmsys    (Linux)
```

Upgrade will overlay existing installed version

Allow five minutes for a new install. Upgrade is typically under one minute.

Permissions

QM uses the operating system file structures and is therefore governed by file permissions.

Consider users as being in three classes:

- Administrators
- Developers
- Others

There is a detailed list of access required to system files by each class of user in the QM Reference Manual.

Don't forget to set application file permissions.

Configuration Parameters

Parameters are in the qmconfig file in the QMSYS account directory.

```
$ls /usr/qmsys
ACCOUNTS      ERRMSG.DIC    $MAP.DIC      $SVLISTS
ACCOUNTS.DIC  $FORMS        MESSAGES      SYSCOM
bin           gcat          NEWVOC        terminfo
BP            $HOLD         prt           terminfo.src
cat           $HOLD.DIC     qmconfig      VOC
DICT.DIC      $IPC          QM.VOCLIB     VOC.DIC
DIR_DICT      licence.txt   readme.txt
errlog        $LOGINS       $SCREENS
ERRMSG        $MAP          $SCREENS.DIC
```

Can amend with any text editor or the Windows QM Config Editor

Configuration Parameters

Changes take effect when QM is next started

Windows:

```
    QMSvc –restart
```

Linux:

```
    qm -restart
```

Configuration Parameters

Parameter values can be viewed with the CONFIG command.

```
Version number 2.8-9
Licence number 0216138423, System id XPXM-XCNK
CMDSTACK  99
DEADLOCK  1
DUMPDIR
ERRLOG    20 kb
EXCLREM   0
FILERULE  7
FLTDIFF   0.00000000002910
FSYNC     0
```

Configuration Parameters

Some parameters are global and apply to all users. Others are private and can be modified with the CONFIG command.

```
CONFIG RECCACHE 10
```

Typically, would modify via the LOGIN script.

Configuration Parameters

Only three configuration parameters are critical to system operation.

The remaining parameters mainly control aspects of user management, security, data integrity, performance and error diagnostics.

NUMFILES Configuration Parameter

Sets size of shared memory file table.

Every file open in QM needs a file table entry.

Opening one file many times uses only one entry.

Default value is 80.

Reaching the limit will cause opens to fail.

Global

IMPORTANT

NUMLOCKS Configuration Parameter

Sets size of shared memory record lock table.

Every record lock needs an entry in this table.

Multiple concurrent READL locks for the same record each need an entry.

Default value is 100.

Attempting to lock a record when the table is full will wait for space to become available.

Global

IMPORTANT

MAXIDLEN Configuration Parameter

Sets the maximum length of a record id.

Defaults to 63, can be up to 255.

Impacts size of locking tables.

QM tracks largest id ever written to each file.

Cannot open a file that has records with id lengths larger than the value of MAXIDLEN.

SELECT or qmfix will correct id limit if records have been deleted.

Global

IMPORTANT

Configuration Parameters

User Management

- Allocation of user numbers

USERPOOL Configuration Parameter

Allows the upper user number that will be assigned to QM processes to be changed from the default 1023.

This value will automatically increase if the licence allows a greater number of processes.

Global

FIXUSERS Configuration Parameter

Some applications rely on specific user numbers being allocated to certain processes.

FIXUSERS=*user,count*

Sets a range of user numbers to be assigned only to processes started with the -123 option where 123 is the required user number.

Global

PORTMAP Configuration Parameter

Some applications allocate user numbers based on tcp/ip port number.

PORTMAP=*port*,*user*,*count*

Assigns a range of tcp/ip port numbers to a corresponding range of QM user numbers.

Global

PHANTOMS Configuration Parameter

Some applications allocate fixed user numbers to phantom processes.

```
PHANTOMS=user,count
```

Assigns a range of QM user numbers for phantoms started with the user number option to the PHANTOM command:

```
PHANTOM USER 5 SALES.ANALYSIS
```

Global

Configuration Parameters

Security and Data Integrity

- Extended file name syntax
- Interoperability of multiple QM servers
- QMClient
- Lock enforcement
- Deadlock management
- File update

FILERULE Configuration Parameter

QM has three extended filename syntaxes:

`account:file`	`FILERULE=1`
`server:account:file`	`FILERULE=2`
`PATH:pathname`	`FILERULE=4`

These must be enabled using FILERULE as they can weaken system security.

Can reduce with CONFIG access but not increase.

Private

NETFILES Configuration Parameter

NETFILES=1 allows opening of files on remote systems (NFS). Dangerous as locking is local to each system.

NETFILES=2 allows incoming QMNet connections.

Can use both together or NETFILES=3

Global

QMCLIENT Configuration Parameter

Provides additional security for QMClient sessions.

QMCLIENT=0	No restrictions
QMCLIENT=1	Bans OPEN and EXECUTE
QMCLIENT=2	Limits subroutine calls

Can increase but not reduce.

Private

FSYNC Configuration Parameter

System integrity after a hardware failure can be improved by force writing file updates but this will degrade performance.

FSYNC=1 Force writes at structural changes to a file (e.g. overflow allocation)

FSYNC=2 Force writes at transaction commit.

Can use both or FSYNC=3

Private

MUSTLOCK Configuration Parameter

Historically, multivalue databases have allowed updates without locking.

This should never have been allowed.

MUSTLOCK=1 enforces strict locking rules.

May require application changes (e.g. single user processing or writing new records).

Private

DEADLOCK Configuration Parameter

Normally QM allows applications to go into deadlock situations.

Diagnostics are easier when the fault is still there.

Setting DEADLOCK=1 causes a program that would create a deadlock to be aborted.

Without transactions there is the possibility of data integrity errors.

Global

SAFEDIR Configuration Parameter

Improves resilience of writes to directory files at the expense of performance.

Writes to a temporary item, deletes original (if any) and then renames temporary item.

Private

Configuration Parameters

Performance

- Record caching
- Sorting

RECCACHE Configuration Parameter

Sets size of record cache.

Default is zero, maximum is 32.

May improve performance of applications that re-read the same data many times.

Private

SORTMEM Configuration Parameter

Query processor sorting uses a memory based sort until the volume of data reaches this limit.

Set in kb, default 1024 (1Mb).

Going over this limit adopts a disk based sort merge algorithm.

Private

SORTWORK Configuration Parameter

Sets location of directory to which intermediate files will be written in a disk sort.

Can help with load balancing.

Private

SORTMRG Configuration Parameter

Determines the number of disk based sort streams merged in each pass.

Default is 4 which works well for most systems.

Minimum 2, maximum 10.

Optimum value depends on relative performance of processor and disk.

Private

Configuration Parameters

Error Diagnostics

- System error log
- Process dump files

ERRLOG Configuration Parameter

The error log provides valuable information in the event of an application error.

```
28 Jan 09 12:14:33 User 34 (pid 4168, sarah, SALES):
   000004F1: Unassigned variable CLI at line 81 of INVOICE
```

Global

ERRLOG Configuration Parameter

The ERRLOG parameter set the size limit in kb.

On reaching this size, the first half of the data is discarded.

Applications can write to the error log using the LOGMSG command or QMBasic statement.

Global

DUMPDIR Configuration Parameter

QM can produce detailed diagnostic dumps of a process at a run time error or on demand.

By default, these are written to the QMSYS directory.

DUMPDIR allows the location of the dump file to be changed.

Can be relative pathname such as "."

Private

PDUMP Configuration Parameter

Process dump files are a great debugging tool but allow a user to see the data of a program in another session, weakening security.

PDUMP=1 limits use of the PDUMP command to processes running with the same user name.

Global

Configuration Parameters

Miscellaneous

- Directories (temporary file, terminfo)
- Startup command
- Spooler configuration (Linux)
- Input date conversion

TEMPDIR Configuration Parameter

Sets the location of the temporary directory.

Defaults to operating system temporary directory if not set.

Ideally should be a directory that can be cleared on reboot.

Careful placement can improve load balancing.

TERMINFO Configuration Parameter

Allows terminfo database to be stored in a non-default location.

Private

STARTUP Configuration Parameter

Executes a command when QM is started.

Typically used to start phantom processes.

Command runs as SYSTEM (Windows) or root (Linux, Mac) which may be too powerful.

AUTHENTICATE command can be used to reduce privileges.

Global

SPOOLER Configuration Parameter

Sets operating system spooler to be used.

Default is to use "lp".

Use of alternative spooler may need the $SPOOLER record in the QMSYS account to be modified.

Private

YEARBASE Configuration Parameter

Moves the start of the 100 year window for entry of two digit year numbers.

Default value is 1930.

Private

Performance Tuning

Operating System Level

Load balancing:

- Put most frequently accessed files on separate disks

- Separate indices from data

Performance Tuning

Application

- Use alternate key indices (up to 32 per file)
- Choose appropriate group size
- Defer dynamic file resizing
- Avoid inefficient program constructs.....

FOR / NEXT Optimisation

```
FOR X = 1 TO DCOUNT(LIST, @VM)
   ...processing...
NEXT X
```

Rewrite as

```
N = DCOUNT(LIST, @VM)
FOR X = 1 TO N
   ...processing...
NEXT X
```

Field Hints

QM maintains a pointer to the last field extracted from a dynamic array.

Extraction of data from a large dynamic array may be considerably faster if it is delimited by field marks.

The RAISE() function can be used to promote all mark characters to the next higher level.

Repeated Extraction

```
BEGIN CASE
   CASE REC<85> = 'A' ; DISPLAY 'Agent'
   CASE REC<85> = 'D' ; DISPLAY 'Dealer'
   ...etc...
```

Rewrite as

```
TYPE = REC<85>
BEGIN CASE
   CASE TYPE = 'A' ; DISPLAY 'Agent'
   CASE TYPE = 'D' ; DISPLAY 'Dealer'
   ...etc...
```

Select List Transfer

```
LIST = ""
LOOP
   READNEXT ID ELSE EXIT
   LIST<-1> = ID
REPEAT
```

Rewrite as

```
READLIST LIST
```

Loop Termination

```
EOF = ""
LOOP
   READNEXT ID ELSE EOF = 'END'
UNTIL EOF = 'END'
   ...processing...
REPEAT
```

Rewrite as

```
LOOP
   READNEXT ID ELSE EXIT
   ...processing...
REPEAT
```

Use REMOVE to scan dynamic arrays

```
LOOP
   REMOVE ITEM FROM VAR SETTING MORE
   ...processing...
WHILE MORE
REPEAT
```

The fastest way to scan a large dynamic array

For non-standard delimiters, use REMOVEF()

Select List Termination

```
SELECT FVAR TO 1
LOOP
   READNEXT ID FROM 1 ELSE EXIT
   ...processing...
   INPUT QUIT
UNTIL QUIT = 'Q'
REPEAT
```

Add

```
CLEARSELECT 1
```

to terminate file scan and allow split/merge

Sorting

```
LIST2 = ""
LOOP
   REMOVE ITEM FROM LIST1 SETTING MORE
   LOCATE ITEM IN LIST2<1> BY 'AL' ~
       SETTING POS ELSE
      INS ITEM BEFORE LIST2<POS>
   END
WHILE MORE
REPEAT
```

Rewrite as

```
CALL !SORT(LIST1, LIST2, 'AL')
```

Keep Files Open

Try to avoid opening files in subroutines that will be called in loops.

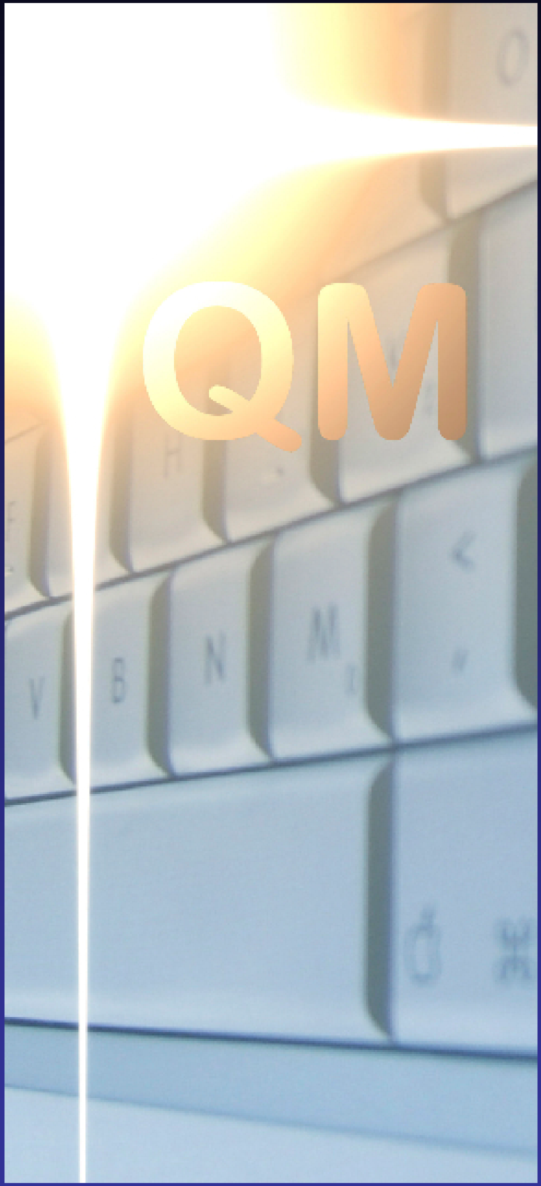
Use common block variables or pass file variables as arguments.

QM has a "file cache" to improve performance of programs that do repeatedly open the same files.

Finding Performance Problems

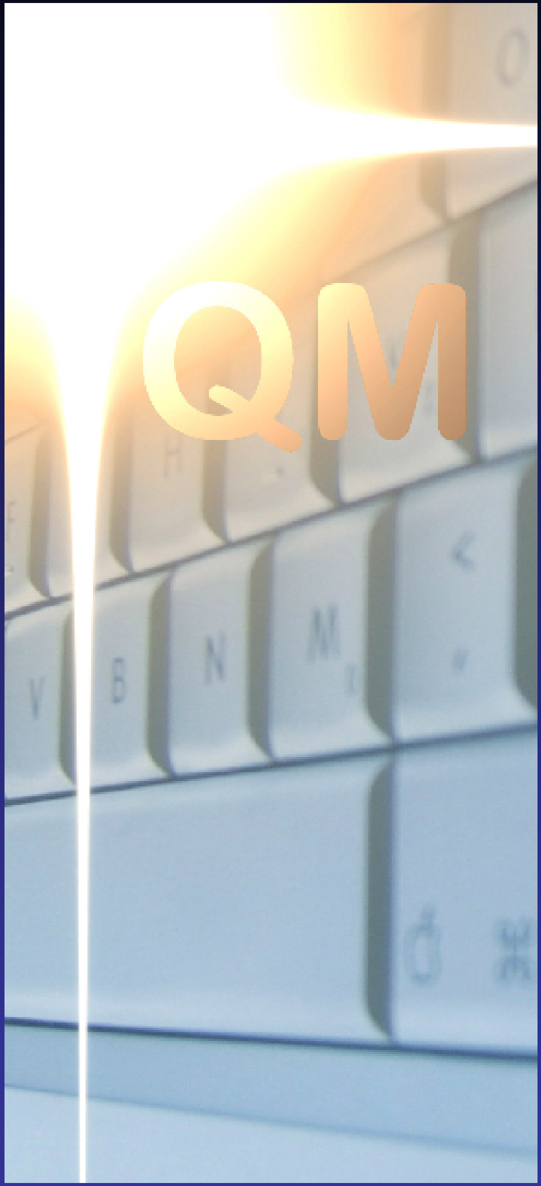
The Hot Spot Monitor (HSM) can be used to report the number of times each subroutine is called and the processor time used by it.

This makes it easy to find the application areas that are worthy of attention.



OpenQM

QUESTIONS?



OpenQM