

Resource shortage in IBM MQ queue manager in Linux,
Probe ID XC035040 from pthread_create, error xecP_E_PROC_LIMIT

<https://www.ibm.com/support/pages/node/470203>

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+++ Question +++

You are running a large number of clients against an IBM MQ queue manager in Linux and you want to know why there are FDC files showing resource shortage:
probeid XC035040 from pthread_create.

An example of the FDC is:

```
| Probe Id :- XC035040
| Component :- xcsCreateThread
| Program Name :- amqrmppa
| Major Errorcode :- xecF_E_UNEXPECTED_SYSTEM_RC
| Probe Description :- AMQ6119: An internal WebSphere MQ error has occurred
| ('11 - Resource temporarily unavailable' from pthread_create.)
| Arith1 :- 11 (0xb) | Comment1 :- '11 - Resource temporarily unavailable' from |
pthread_create.
```

Sometimes, there is an additional entry:

```
| Probe Id :- ZS401010
| Component :- zstStartAsyncConsumeThread
| Major Errorcode :- xecP_E_PROC_LIMIT
| Probe Description :- AMQ6026: A resource shortage prevented the creation of a WebSphere
MQ process.
```

+++ Answer +++

a) The Operating System error in the FDC is:

```
define EAGAIN      11      /* Resource temporarily unavailable - try again */
```

The Operating System returns the error EAGAIN because of insufficient ulimit configuration or because of CPU starvation.

EAGAIN Insufficient resources to create another thread, or a system-imposed limit on the number of threads was encountered.

The latter case may occur in two ways:

- the RLIMIT_NPROC soft resource limit (set via setrlimit(2)), which limits the number of process for a real user ID, was reached; or
- the kernel's system-wide limit on the number of threads, /proc/sys/kernel/threads-max, was reached.

The application was running from the user "mqm".

Customer needs to check the resource allocation for user "mqm" and modify as required:

- If there was no CPU starvation, it is suggested reviewing the "ulimit -a" configuration (particularly the stack limit) for the user "mqm".
- One of the main attributes of interest is maxuproc (Specifies the maximum number of processes per user ID).

The following command will give a system-wise thread total:

```
ps -eo nlwp | tail -n +2 | awk '{ num_threads += $1 } END { print num_threads }'
```

Another option for an individual process is

```
ps -o thcount <pid>
```

There is nothing that can be done from the perspective of the MQ queue manager, who is at the mercy of the available system resources by the Operating System.

Thus, when the OS is telling the queue manager, there is error 11, the queue manager is not expecting this reason code and generates an FDC.

You will need to reference the following articles and work with your Operation System Support Team to fine tune the parameters mentioned in the articles.

It usually seems to come down to one of:

- nproc value
- kernel.pid_max in /proc/sys/kernel/kernel.pid_max
- kernel.threads-max in /proc/sys/kernel/threads-max
- thread stack size in ulimit.

b) The following page from the MQ documentation has more details on some kernel parameters that can be tuned:

<https://www.ibm.com/docs/en/ibm-mq/9.3?topic=linux-configuring-tuning-operating-system>

IBM MQ 9.3

Configuring and tuning the operating system on Linux

The minimum configuration for MQ for these resources is as follows:

Table 1. Minimum tunable kernel parameters values

Name	Kernel-name	Value	Increase	Description
shmmni segments	kernel.shmmni	4096	Yes	Maximum number of shared memory
shmmax	kernel.shmmax	268435456	No	Maximum size of a shared-memory segment (bytes)
shmall	kernel.shmall	2097152	Yes	Maximum amount of shared memory (pages)
semmsl	kernel.sem	32	No	Maximum amount of semaphores permitted per set
semmns	kernel.sem	4096	Yes	Maximum number of semaphores
semopm	kernel.sem	32	No	Maximum number of operations in single operations
semmni	kernel.sem	128	Yes	Maximum number of semaphore sets
thrmax	kernel.threads-max	32768	Yes	Maximum number of threads
pidmax	kernel.pid_max	32768	Yes	Maximum number of process identifiers

Notes:

1: These values are sufficient to run two moderate sized queue managers on the system. If you intend to run more than two queue managers, or the queue managers are to process a significant workload, you might need to increase the values displayed as Yes in the Increase column.

2: The kernel.sem values are contained within a single kernel parameter containing the four values in order.

+ Additional resources

<http://ibm-messaging.github.io/mqperf/>

MQ Performance documents

Repository for MQ related performance documents

- IBM MQ V9.1 for Linux (x86-64 platform) Performance Report:

http://ibm-messaging.github.io/mqperf/MQ_for_xLinux_V910_Performance.pdf
MQ_for_xLinux_V910_Performance.pdf

- IBM MQ V9.1 for Windows Performance Report:

http://ibm-messaging.github.io/mqperf/MQ_for_Windows_V910_Performance.pdf
MQ_for_Windows_V910_Performance.pdf

- IBM MQ V9.2 for Linux (x86-64 platform) Performance Report:

http://ibm-messaging.github.io/mqperf/MQ_V9.2_Performance_Report_xLinux.pdf
MQ_for_xLinux_V9.2_Performance.pdf

- IBM MQ V9.3 for Linux (x86-64 platform) Performance Report:

http://ibm-messaging.github.io/mqperf/MQ_V9.3_Performance_Report_xLinux_v1.pdf
MQ_for_xLinux_V9.3_Performance.pdf

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