

[OpenVMS] How to Troubleshoot a Process in RWNPG
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PRODUCT: DIGITAL OpenVMS VAX, All Versions
DIGITAL OpenVMS Alpha, All Versions

COMPONENT: Scheduler

SOURCE: Compaq Computer Corporation

OVERVIEW:

This article describes the RWNPG resource wait state, with some workarounds, which should help to resolve the issue.

BACKGROUND:

The resource wait state RWNPG is most commonly due to a process waiting for space in non-paged pool. It indicates that the pool area does not have enough contiguous space for the allocation request, and that it can't expand any further because of insufficient fluid pages. The state will often be accompanied by the following console error message:

```
SYSTEM-W-POOLEXP, Pool expansion failure
```

"Non-paged pool" is defined as Large Request Packets (LRPs), I/O Request Packets (IRPs), Small Request Packets (SRPs) and Non-Paged Dynamic Memory (NPAGEDYN) in pre-V6.0 versions of OpenVMS VAX. And consists only of NPAGEDYN on OpenVMS VAX V6.0 and later.

For OpenVMS to allow any pool expansion, the system checks to see if the pool is already at its limit and that there are enough fluid pages for the expansion. If not, the process is put into RWNPG until pool has been deallocated or there are enough fluid pages.

The following calculations for the different versions of OpenVMS VAX is used to see if there are enough fluid pages:

OpenVMS VAX, Versions 5.0 through 5.5-2

```
-----  
PFN$GL_PHYPGCNT - (FREELIM + MPW_LOLIMIT +  
                  (the lower of WSMAX or 65535))
```

OpenVMS VAX, Versions 6.0 and above

```
-----  
MMG$GL_MINFLUID - (PFN$GL_PHYPGCNT - (FREELIM + MPW_LOLIMIT))
```

OpenVMS Alpha, All versions

```
-----  
(The lower of SWP$GL_SWAP_IMAGE_SIZE_MAX or SGN$GL_MAXWSCNT_PAGES) -  
(PFN$GL_PHYPGCNT - (FREELIM + MPW_LOLIMIT))
```

If the algorithm determines that there are insufficient fluid pages for pool expansion, an error is returned and the process can be placed in RWNPG state. This is also an indication of an overall deficit of fluid pages on the system.

The RWNPG state is also used by the Lock Manager, when it needs to expand the LOCKIDTBL. It uses the same algorithms for determining the availability of fluid pages for LOCKIDTBL expansion. If there are insufficient fluid pages to expand the LOCKIDTBL, the process can be placed into RWNPG, even if there's non-paged pool available.

Note:

If the Distributed Lock Manager is remastering locks on the interrupt stack, and needs to expand the LOCKIDTBL, it may cause the system to crash if there are not enough fluid pages available.

In another instance it was found that RWNPG is used when a process is trying to write to the JOB_CONTROLLER mailbox and it is full.

WORKAROUND 1:

Use the command SHOW MEMORY/POOL/FULL to check which pool area needs to be, or is, expanded by comparing the current and initial sizes. An expansion of 10% is normal. Pool expansion greater than 10% is an indication that the area of pool needs to be adjusted.

Note:

See the RELATED ARTICLE section addressing SYSTEM-W-POOLEXPf.

If after multiple adjustments the pool area continues to expand, there may be a "memory leak" (something allocating memory and not deallocating it). If this is the case, different techniques will be needed to investigate the cause.

WORKAROUND 2:

Another common cause for this state are disk caching products that take a significant amount of pages off of the Free Page List, to use for data caching. This reduces the number of fluid pages and can result in the pool's inability to expand.

Note:

See the RELATED ARTICLE section addressing SYSTEM-W-POOLEXPf with the IOEXPRESS product.

Limiting the cache size of a disk caching product will help to avoid this problem in the future.

You can use the System Dump Analyzer (SDA) to determine if there are enough fluid pages to allow the pool to expand. For example:

```
$ SET PROCESS/PRIVILEGE=CMKRNL
$ ANALYZE/SYSTEM

SDA> EVAL @PFN$GL_PHYPGCNT          <-- Fluid Pages Left
Hex = 0006F050   Decimal = 454736
```

WORKAROUND 3:

Another cause for this state is a very large value for the SYSGEN parameter WSMAX, on a limited memory system. Reducing WSMAX or upgrading to OpenVMS VAX, V6.0 - which no longer uses WSMAX in the calculation - should resolve the problem.