

# ***Unknown Status on Overloaded Servers***

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This technical note addresses the issue of some servers shutting down when overloaded. It also provides a workaround for resolving the problem.

## **Servers affected**

- Job Queue Manager (JQM) server
- Destination Manager (DSM) server
- Configuration Manager (CM) server

## **Problem**

When a user attempts to execute an HP Output Server command on a batch of jobs, the JQM, CM and DSM servers go into an 'unknown' state, or they generate a core dump. Executing an HP Output Server command on a batch of jobs forces the servers to attempt to allocate more memory than allowed by the specified data segment stack size.

## **Solution**

You can avoid this problem by using one of the following methods:

- Increasing the data segment stack size
- Using indexed attributes for HP Output Server commands
- Using arenas and extensionpages to allocate memory (HP-UX)

### **Increasing the data segment stack size**

Increase the data segment stack size by using the `ulimit` command. Each operating system uses a separate data segment stack size. Find the current data segment stack size by using the following command:

```
ulimit -a
```

Example

Output for `ulimit -a` command on the Solaris platform:

```
$ulimit -a
time (seconds) - unlimited
file (blocks) - unlimited
data (kbytes) - 96000
```

### Solution

```
stack (kbytes) - 8192
coredump (blocks) - unlimited
nofiles (descriptors) - 256
vmemory (kbytes) - unlimited
```

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NOTE: Check the help information of `ulimit` command on each operating system to change the data segment stack size.

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## Using indexed attributes for HP Output Server commands

When a command is entered, the server buffers all the data for the request and sends it as output. Users should avoid making command requests that could overload the server.

For example, `pdls -c job -a all jqm:`

```
orpdls -c job -a all -x"-job-status retained" jqm:
```

Following is a list of indexed attributes used for HP Output Server commands:

Server Name	Table Name	Indexed Attribute
Accounting and Inventory Manager (AIM)	table_001	COLUMN_001_001, COLUMN_001_003
	table_002	COLUMN_002_001, COLUMN_002_002, COLUMN_002_003, COLUMN_002_005, COLUMN_002_006, COLUMN_002_010
	table_003	COLUMN_003_001, COLUMN_003_002, COLUMN_003_007, COLUMN_003_008
	table_004	COLUMN_004_001
	table_005	COLUMN_005_001
	table_006	COLUMN_006_001, COLUMN_006_002, COLUMN_006_003
	table_007	COLUMN_007_001, COLUMN_007_002, COLUMN_007_003
	table_008	COLUMN_008_001, COLUMN_008_002
	table_009	COLUMN_009_001, COLUMN_009_002, COLUMN_009_003, COLUMN_009_004, COLUMN_009_005, COLUMN_009_006, COLUMN_009_007, COLUMN_009_008, COLUMN_009_009, COLUMN_009_010, COLUMN_009_011, COLUMN_009_012
	table_010	COLUMN_010_001
	table_011	COLUMN_011_001
	table_012	COLUMN_012_001, COLUMN_012_002, COLUMN_012_007, COLUMN_012_009
	table_013	COLUMN_013_006
	table_014	COLUMN_014_005, COLUMN_014_009
	table_015	COLUMN_015_003
	table_016	COLUMN_016_003
	table_017	COLUMN_017_004

Server Name	Table Name	Indexed Attribute
	table_018	COLUMN_018_001
	table_019	COLUMN_019_001, COLUMN_019_002
	schema	version
Privilege Manager (PM)	ctdb_tbl	dbkey
	gdb_group	group_name
	gdb_members	group_name, member_name
	pdb_tbl	dbkey, crypt
	ptdb_tbl	dbkey
Event manager (EM)	clients	client_id
	subscriptions	client_id
CM	002 (printer)	__name, printer-realization, printer-connection-mode, managing-server, template, template-classification, template-type, template-device-name, physical-device-type
	003 (server)	__name, managing-server, template, template-classification, template-type, template-device-name
	051 (queue)	__name, scheduler-assigned, managing-server, template, template-classification, template-type, template-device-name
	101 (transformer)	__name, managing-server, template, template-classification, template-type, template-device-name
	102 (form)	__name, managing-server, template, template-classification, template-type, template-device-name
	103 (paging system)	__name, managing-server, template, template-classification, template-type, template-device-name
	105 (device type)	__name, managing-server, template, template-classification, template-type, template-device-name, device-type-manufacturer, device-type-model
	107 (capabilities)	__name, managing-server, template, template-classification, template-type, template-device-name
Delivery Manager (DLM)	001 (job)	__name, current-job-state, submission-time
	003 (server)	__name
	016 (dlm job)	__name, current-dlm-job-state, dlm-job-submission-time

Solution

Server Name	Table Name	Indexed Attribute
JQM	001 (job)	__name, job-name, job-owner, destination, current-job-state, queue-assigned, job-completion-status, physical-printer-assigned, job-retain-time
	002 (printer)	__name, printer-realization, queue-supported
	003 (server)	__name
	051 (queue)	__name, scheduler-assigned
	107 (capabilities)	__name
DSM	002 (printer)	__name, queue-supported, printer-connection-mode, physical-device-type
	003 (server)	__name
	101 (transformer)	__name
	107 (capabilities)	__name

Following is a list of indexed attributes used for HP Output Server commands:

Server Name	Table Name	Indexed Attribute
Accounting and Inventory Manager (AIM)	table_001	COLUMN_001_001, COLUMN_001_003
	table_002	COLUMN_002_001, COLUMN_002_002, COLUMN_002_003, COLUMN_002_005, COLUMN_002_006, COLUMN_002_010
	table_003	COLUMN_003_001, COLUMN_003_002, COLUMN_003_007, COLUMN_003_008
	table_004	COLUMN_004_001
	table_005	COLUMN_005_001
	table_006	COLUMN_006_001, COLUMN_006_002, COLUMN_006_003
	table_007	COLUMN_007_001, COLUMN_007_002, COLUMN_007_003
	table_008	COLUMN_008_001, COLUMN_008_002
	table_009	COLUMN_009_001, COLUMN_009_002, COLUMN_009_003, COLUMN_009_004, COLUMN_009_005, COLUMN_009_006, COLUMN_009_007, COLUMN_009_008, COLUMN_009_009, COLUMN_009_010, COLUMN_009_011, COLUMN_009_012
	table_010	COLUMN_010_001
	table_011	COLUMN_011_001
	table_012	COLUMN_012_001, COLUMN_012_002, COLUMN_012_007, COLUMN_012_009
	table_013	COLUMN_013_006

Server Name	Table Name	Indexed Attribute
	table_014	COLUMN_014_005,COLUMN_014_009
	table_015	COLUMN_015_003
	table_016	COLUMN_016_003
	table_017	COLUMN_017_004
	table_018	COLUMN_018_001
	table_019	COLUMN_019_001,COLUMN_019_002
	schema	version
Privilege Manager (PM)	ctdb_tbl	dbkey
	gdb_group	group_name
	gdb_members	group_name,member_name
	pdb_tbl	dbkey, crypt
	ptdb_tbl	dbkey
Event manager (EM)	clients	client_id
	subscriptions	client_id
CM	002 (printer)	__name,printer-realization,printer-connection-mode,managing-server,template,template-classification,template-type,template-device-name,physical-device-type
	003 (server)	__name,managing-server,template,template-classification,template-type,template-device-name
	051 (queue)	__name,scheduler-assigned,managing-server,template,template-classification,template-type,template-device-name
	101 (transformer)	__name,managing-server,template,template-classification,template-type,template-device-name
	102 (form)	__name,managing-server,template,template-classification,template-type,template-device-name
	103 (paging system)	__name,managing-server,template,template-classification,template-type,template-device-name
	105 (device type)	__name,managing-server,template,template-classification,template-type,template-device-name,device-type-manufacturer,device-type-model
	107 (capabilities)	__name,managing-server,template,template-classification,template-type,template-device-name
Delivery Manager (DLM)	001 (job)	__name,current-job-state,submission-time

Solution

Server Name	Table Name	Indexed Attribute
	003 (server)	__name
	016 (dlm job)	__name, current-dlm-job-state, dlm-job-submission-time
JQM	001 (job)	__name, job-name, job-owner, destination, current-job-state, queue-assigned, job-completion-status, physical-printer-assigned, job-retention-time
	002 (printer)	__name, printer-realization, queue-supported
	003 (server)	__name
	051 (queue)	__name, scheduler-assigned
	107 (capabilities)	__name
DSM	002 (printer)	__name, queue-supported, printer-connection-mode, physical-device-type
	003 (server)	__name
	101 (transformer)	__name
	107 (capabilities)	__name

Following is a list of indexed attributes used for HP Output Server commands:

Server Name	Table Name	Indexed Attribute
Accounting and Inventory Manager (AIM)	table_001	COLUMN_001_001, COLUMN_001_003
	table_002	COLUMN_002_001, COLUMN_002_002, COLUMN_002_003, COLUMN_002_005, COLUMN_002_006, COLUMN_002_010
	table_003	COLUMN_003_001, COLUMN_003_002, COLUMN_003_007, COLUMN_003_008
	table_004	COLUMN_004_001
	table_005	COLUMN_005_001
	table_006	COLUMN_006_001, COLUMN_006_002, COLUMN_006_003
	table_007	COLUMN_007_001, COLUMN_007_002, COLUMN_007_003
	table_008	COLUMN_008_001, COLUMN_008_002
	table_009	COLUMN_009_001, COLUMN_009_002, COLUMN_009_003, COLUMN_009_004, COLUMN_009_005, COLUMN_009_006, COLUMN_009_007, COLUMN_009_008, COLUMN_009_009, COLUMN_009_010, COLUMN_009_011, COLUMN_009_012
	table_010	COLUMN_010_001
	table_011	COLUMN_011_001

Server Name	Table Name	Indexed Attribute
	table_012	COLUMN_012_001,COLUMN_012_002,COLUMN_012_007, COLUMN_012_009
	table_013	COLUMN_013_006
	table_014	COLUMN_014_005,COLUMN_014_009
	table_015	COLUMN_015_003
	table_016	COLUMN_016_003
	table_017	COLUMN_017_004
	table_018	COLUMN_018_001
	table_019	COLUMN_019_001,COLUMN_019_002
	schema	version
Privilege Manager (PM)	ctdb_tbl	dbkey
	gdb_group	group_name
	gdb_members	group_name,member_name
	pdb_tbl	dbkey, crypt
	ptdb_tbl	dbkey
Event manager (EM)	clients	client_id
	subscriptions	client_id
CM	002 (printer)	__name,printer-realization,printer-connection -mode,managing-server,template,template-c lassification,template-type,template-devi ce-name,physical-device-type
	003 (server)	__name,managing-server,template,template-clas sification,template-type,template-device- name
	051 (queue)	__name,scheduler-assigned,managing-server,tem plate,template-classification,template-ty pe,template-device-name
	101 (transformer)	__name,managing-server,template,template-clas sification,template-type,template-device- name
	102 (form)	__name,managing-server,template,template-clas sification,template-type,template-device- name
	103 (paging system)	__name,managing-server,template,template-clas sification,template-type,template-device- name
	105 (device type)	__name,managing-server,template,template-clas sification,template-type,template-device- name,device-type-manufacturer,device-type -model

Server Name	Table Name	Indexed Attribute
	107 (capabilities)	__name, managing-server, template, template-classification, template-type, template-device-name
Delivery Manager (DLM)	001 (job)	__name, current-job-state, submission-time
	003 (server)	__name
	016 (dlm job)	__name, current-dlm-job-state, dlm-job-submission-time
JQM	001 (job)	__name, job-name, job-owner, destination, current-job-state, queue-assigned, job-completion-status, physical-printer-assigned, job-retention-time
	002 (printer)	__name, printer-realization, queue-supported
	003 (server)	__name
	051 (queue)	__name, scheduler-assigned
	107 (capabilities)	__name
DSM	002 (printer)	__name, queue-supported, printer-connection-mode, physical-device-type
	003 (server)	__name
	101 (transformer)	__name
	107 (capabilities)	__name

Following is a list of indexed attributes used for HP Output Server commands:

Server Name	Table Name	Indexed Attribute
Accounting and Inventory Manager (AIM)	table_001	COLUMN_001_001, COLUMN_001_003
	table_002	COLUMN_002_001, COLUMN_002_002, COLUMN_002_003, COLUMN_002_005, COLUMN_002_006, COLUMN_002_010
	table_003	COLUMN_003_001, COLUMN_003_002, COLUMN_003_007, COLUMN_003_008
	table_004	COLUMN_004_001
	table_005	COLUMN_005_001
	table_006	COLUMN_006_001, COLUMN_006_002, COLUMN_006_003
	table_007	COLUMN_007_001, COLUMN_007_002, COLUMN_007_003
	table_008	COLUMN_008_001, COLUMN_008_002

Server Name	Table Name	Indexed Attribute
	table_009	COLUMN_009_001,COLUMN_009_002,COLUMN_009_003, COLUMN_009_004,COLUMN_009_005,COLUMN_009_006, COLUMN_009_007,COLUMN_009_008,COLUMN_009_009, COLUMN_009_010,COLUMN_009_011,COLUMN_009_012
	table_010	COLUMN_010_001
	table_011	COLUMN_011_001
	table_012	COLUMN_012_001,COLUMN_012_002,COLUMN_012_007, COLUMN_012_009
	table_013	COLUMN_013_006
	table_014	COLUMN_014_005,COLUMN_014_009
	table_015	COLUMN_015_003
	table_016	COLUMN_016_003
	table_017	COLUMN_017_004
	table_018	COLUMN_018_001
	table_019	COLUMN_019_001,COLUMN_019_002
	schema	version
Privilege Manager (PM)	ctdb_tbl	dbkey
	gdb_group	group_name
	gdb_members	group_name,member_name
	pdb_tbl	dbkey, crypt
	ptdb_tbl	dbkey
Event manager (EM)	clients	client_id
	subscriptions	client_id
CM	002 (printer)	__name,printer-realization,printer-connection-mode, managing-server,template,template-classification, template-type,template-device-name,physical-device-type
	003 (server)	__name,managing-server,template,template-classification, template-type,template-device-name
	051 (queue)	__name,scheduler-assigned,managing-server,template, template-classification,template-type,template-device-name
	101 (transformer)	__name,managing-server,template,template-classification, template-type,template-device-name
	102 (form)	__name,managing-server,template,template-classification, template-type,template-device-name

Server Name	Table Name	Indexed Attribute
	103 (paging system)	__name, managing-server, template, template-classification, template-type, template-device-name
	105 (device type)	__name, managing-server, template, template-classification, template-type, template-device-name, device-type-manufacturer, device-type-model
	107 (capabilities)	__name, managing-server, template, template-classification, template-type, template-device-name
Delivery Manager (DLM)	001 (job)	__name, current-job-state, submission-time
	003 (server)	__name
	016 (dlm job)	__name, current-dlm-job-state, dlm-job-submission-time
JQM	001 (job)	__name, job-name, job-owner, destination, current-job-state, queue-assigned, job-completion-status, physical-printer-assigned, job-retention-time
	002 (printer)	__name, printer-realization, queue-supported
	003 (server)	__name
	051 (queue)	__name, scheduler-assigned
	107 (capabilities)	__name
DSM	002 (printer)	__name, queue-supported, printer-connection-mode, physical-device-type
	003 (server)	__name
	101 (transformer)	__name
	107 (capabilities)	__name

Following is a list of indexed attributes used for HP Output Server commands:

Server Name	Table Name	Indexed Attribute
Accounting and Inventory Manager (AIM)	table_001	COLUMN_001_001,COLUMN_001_003
	table_002	COLUMN_002_001,COLUMN_002_002,COLUMN_002_003,COLUMN_002_005,COLUMN_002_006,COLUMN_002_010
	table_003	COLUMN_003_001,COLUMN_003_002,COLUMN_003_007,COLUMN_003_008
	table_004	COLUMN_004_001
	table_005	COLUMN_005_001
	table_006	COLUMN_006_001,COLUMN_006_002,COLUMN_006_003
	table_007	COLUMN_007_001,COLUMN_007_002,COLUMN_007_003
	table_008	COLUMN_008_001,COLUMN_008_002
	table_009	COLUMN_009_001,COLUMN_009_002,COLUMN_009_003,COLUMN_009_004,COLUMN_009_005,COLUMN_009_006,COLUMN_009_007,COLUMN_009_008,COLUMN_009_009,COLUMN_009_010,COLUMN_009_011,COLUMN_009_012
	table_010	COLUMN_010_001
	table_011	COLUMN_011_001
	table_012	COLUMN_012_001,COLUMN_012_002,COLUMN_012_007,COLUMN_012_009
	table_013	COLUMN_013_006
	table_014	COLUMN_014_005,COLUMN_014_009
	table_015	COLUMN_015_003
	table_016	COLUMN_016_003
	table_017	COLUMN_017_004
	table_018	COLUMN_018_001
	table_019	COLUMN_019_001,COLUMN_019_002
	schema	version
Privilege Manager (PM)	ctdb_tbl	dbkey
	gdb_group	group_name
	gdb_members	group_name,member_name
	pdb_tbl	dbkey, crypt
	ptdb_tbl	dbkey
Event manager (EM)	clients	client_id

Server Name	Table Name	Indexed Attribute
	subscriptions	client_id
CM	002 (printer)	__name,printer-realization,printer-connection-mode,managing-server,template,template-classification,template-type,template-device-name,physical-device-type
	003 (server)	__name,managing-server,template,template-classification,template-type,template-device-name
	051 (queue)	__name,scheduler-assigned,managing-server,template,template-classification,template-type,template-device-name
	101 (transformer)	__name,managing-server,template,template-classification,template-type,template-device-name
	102 (form)	__name,managing-server,template,template-classification,template-type,template-device-name
	103 (paging system)	__name,managing-server,template,template-classification,template-type,template-device-name
	105 (device type)	__name,managing-server,template,template-classification,template-type,template-device-name,device-type-manufacturer,device-type-model
	107 (capabilities)	__name,managing-server,template,template-classification,template-type,template-device-name
Delivery Manager (DLM)	001 (job)	__name,current-job-state,submission-time
	003 (server)	__name
	016 (dlm job)	__name,current-dlm-job-state,dlm-job-submission-time
JQM	001 (job)	__name,job-name,job-owner,destination,current-job-state,queue-assigned,job-completion-status,physical-printer-assigned,job-rotation-time
	002 (printer)	__name,printer-realization,queue-supported
	003 (server)	__name
	051 (queue)	__name,scheduler-assigned
	107 (capabilities)	__name
DSM	002 (printer)	__name,queue-supported,printer-connection-mode,physical-device-type
	003 (server)	__name
	101 (transformer)	__name

Server Name	Table Name	Indexed Attribute
	107 (capabilities)	__name

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NOTE: For information on which attributes need to be indexed and which do not, see the readme file located at `$DAZEL_HOME/nls/oid/C/README.DPAOIDS`.

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## Using arenas and extensionpages to allocate memory (HP-UX)

HP-UX uses arenas to allocate memory to each thread. When a request for memory is received from a new thread, the HP-UX operating system allocates additional memory. This may lead to an increase in the memory usage for each operation as the requests get served by different threads each time. Memory usage can increase until it exceeds the data segment size limit that is set by the `ulimit` parameter.

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NOTE: This limit exceeds when several `pdls` commands are executed on the Configuration Manager (CM) and the CM stops responding.

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This behavior of HP-UX memory allocator can be altered using the `_M_ARENA_OPTS` environment variable. To control the memory growth, set the `_M_ARENA_OPTS` environment variable as a value of the `-server-environment-variables` attribute with the `config_server` command. You can use `_M_ARENA_OPTS` to tune the number of arenas and the extensionpages for threaded applications.

An arena is a linked list that a group of threads share. The default is 8 arenas per process. Extensionpages control the number of pages to expand each time, assuming that the default page size used is of 4096 Bytes (4KB).

When there are more threads in an application, more arenas should be used for better performance. In general, the more arenas you use, the smaller the extensionpages should be, and vice versa. However, this would also result in an increase in memory usage.

The number of arenas can range from 1 to 64 for threaded applications. If the `_M_ARENA_OPTS` environment variable is not set, or the number of arenas is set to be out of range, the default number of arenas used is 8. The extensionpages is from 1 to 4096. If the extensionpages is set to be out of range, the default value of 32 is used.

### For Example

```
export _M_ARENA_OPTS=1:8
```

`_M_ARENA_OPTS` is interpreted as:

```
_M_ARENA_OPTS=#arenas:#extensionpages
```

In the above example, arenas is the number of arena's to be used for the application while *extensionpages* determines the number of pages to be expanded each time. Here the extensionpages determine by how many page sizes an arena would grow when an arena needs more memory. Assuming that a `vps_pagesize` uses a default page size of 4096 Bytes (4KB), this would mean that an arena would expand with  $8 \times 4 = 32$ KB when it needs more memory with a setting of `_M_ARENA_OPTS=1:8`.

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NOTE: The default value for `_M_ARENA_OPTS` is `8:32`

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To resolve the problem of server crash due to memory issue, use a single arena and set the extensionpages based on your requirements.

Some examples on how to prevent the overloaded servers going into an an unknown state (due to a memory issue) are detailed below.

*Example 1:*

In the JQM server during heavy activity, the `pdls` command is used on a job and the memory consumption exceeds the data segment limit of the system. If the jobs are submitted while querying the job status, the server consumes more memory and fails.

Restarting JQM server causes the server to use a single arena for all the memory allocation requests preventing the server memory from increasing for any of the subsequent requests.

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NOTE: The memory growth for a specific server can also be restricted by setting the `-server-environment-variables` attribute for that server. Setting the `_M_ARENA_OPTS` variable may adversely affect the performance of an application, as per HP-UX manual for `malloc`, use of different arena for each thread leads to better server performance.

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The `_M_ARENA_OPTS` can also be set for a specific server (JQM or any other) by using `-server-environment-variables` attribute. You can set this attribute by using the following command:

```
config_server -u -x"-server-environment-variables \"_M_ARENA_OPTS=1:8\""
jqm
```

---

NOTE: For more information on `_M_ARENA_OPTS`, refer to the following link:  
<http://devsrc1.external.hp.com/STK/cgi-bin/man2html?debug=0&manpage=/usr/share/man/man3.Z/malloc.3c>

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*Example 2:*

In the DSM server, use of an advanced template (with 150 destinations) increases the memory size to 200MB. The combination of memory usage and APF destination causes this increase. But the estimate of memory usage of these destinations is 200k to 500k per physical destination. The memory increase is caused due to a specific feature present in the HP-UX heap manager that sometimes causes DSM server to gain memory. By default, the HP-UX heap manager uses sub-heaps, which it calls arenas. These arenas are thread specific, and there are eight of them (default). Unless changed, this causes HP Output Server processes, such as DSM server, to get larger than needed.

To make the HP-UX heap manager behave like any other heap manager, execute the following command:

```
config_server -u -x"-server-environment-variables \"_M_ARENA_OPTS=1:32\""
dsm
```

This command changes the heap manager's behavior for DSM server. With this setting of `_M_ARENA_OPTS`, there is only one arena (like all the other heap managers.) This setting is recommended for any of the DSMs that run APF physicals.

*Example 3:*

In the CM server, executing the `pdconfig` command results in substantial growth of memory. A memory spike occurs on the server when the `'pdconfig -d -c /tmp/x.cf'` command is executed. This increases the memory growth to 121MB. A feature in HP-UX heap manager (`malloc` and `free`) creates separate heaps for each thread in the multi-threaded program. This problem occurs when different `RPC WorkerThreads` allocate memory to serve the `pdls -c class RPC` that comes from the `pdconfig` client.

The large size of the configuration causes CM server to allocate about 40MB to serve one `pdls -cp ids_ccm:rpc` call. All of this memory is allocated in one arena since it is all allocated only on one thread. When another `pdls -cp ids_ccm:rpc` call is made, this RPC is served by another RPC worker thread. This causes the CM server to allocate another 40MB in another heap arena. In this case, the original 40MB, which was allocated and later cleared, is not reused. Instead the heap manager asks HP-UX for another 40MB of virtual memory. Eventually `pdls` calls fill up the arenas to exceed the 128MB per-process data limit.

To rectify this problem, the behavior of the HP-UX heap manager should be modified by adding the following environment variable in the `HostConfig.sgml` entry for the environment-variables host attribute:

```
_M_ARENA_OPTS=1:8
```

This command forces the HP-UX heap manager to use a single `arena`. So when the CM server is run, the first `pdconfig -d` command invocation raises the memory size of the CM server from 14MB to 58MB while the subsequent `pdconfig -d` invocations do not raise the memory size above 58MB.

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NOTE: The use of the `_M_ARENA_OPTS` environment variable is described in the HP-UX `malloc` man page.

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## Conclusion

The servers buffer all the output for a given command operation in their memory prior to marshalling the data to the server client. This causes the servers to fail when the number of jobs is large. The only way to avoid the failure is to increase the data segment size (this can only reduce the probability of server crash) or avoid issuing a command on any batch of jobs.

*Conclusion*