

OPS-16: How Do I Kill Thee? Paul Koufalis

PROGRESS SOFTWARE

OPS-16: How Do I Kill Thee?

Let me count the ways...

Paul Koufalis
President
Progresswiz Consulting

Exchange 08

This slide features a blue header with the Progress Software logo. The main content area is white with a blue border. The title 'OPS-16: How Do I Kill Thee?' is in blue. Below it is the phrase 'Let me count the ways...' in italics. The speaker's name and title are in the bottom right. The Exchange 08 logo is in the bottom right corner.

Progresswiz Consulting

- Based in Montréal, Québec, Canada
- Providing technical consulting services in Progress®, UNIX, Windows, MFG/PRO and more
- Specialized in performance tuning, system availability and business continuity planning

Exchange 08

OPS-16: How Do I Kill Thee?

This slide has a blue header with the text 'Progresswiz Consulting'. The main content area is white with a blue border. It contains a bulleted list of three items. The Exchange 08 logo is in the bottom right corner. A small footer text 'OPS-16: How Do I Kill Thee?' is in the bottom left corner.

Agenda

- Introduction
- Background
- Myths and Misconceptions
- The Killing Process
- Questions

Exchange 08

OPS-16: How Do I Kill Thee?

This slide has a blue header with the text 'Agenda'. The main content area is white with a blue border. It contains a bulleted list of five items. The Exchange 08 logo is in the bottom right corner. A small footer text 'OPS-16: How Do I Kill Thee?' is in the bottom left corner.

OPS-16: How Do I Kill Thee?

Paul Koufalis

First things first...

- This session describes OpenEdge® 10.1x behavior
 - Mostly applies to V9
- I do not work for Progress, nor do I have access to any insider information, so:
 - Your Mileage May Vary
 - Use the information in this presentation at your own risk and peril!



OPS-16: How Do I Kill Thee?

Introduction

- There are still a lot of ChUI, UNIX-based applications out there
 - Clients are connecting to databases via shared-memory
 - No matter how hard you try, a user will still figure out a way to hang a session
 - Killing users will remain a common task (but hopefully not too common)



OPS-16: How Do I Kill Thee?

Introduction (cont...)

- The need was there, so I went about trying to figure out the best method
 - Searched the peg
 - Searched the Progress KB
- Finally, I found Tom Bascom's article "Traps and Kills"
 - Great start, but not enough to satisfy the techy geek in me



OPS-16: How Do I Kill Thee?

OPS-16: How Do I Kill Thee?

Paul Koufalis

Introduction (cont...)

- And so a project was born:
 - Figure out the best, safest way to kill a Progress session
 - Write a script that will automate the task as much as possible
- The result: killprosession.sh
 - All yours for free!
 - Of course, no support, YMMV, use at your own risk!!
 - Available via email to pk@progresswiz.com

OPS-16: How Do I Kill Thee?



Background

- Just to make sure everyone is on the same page, we need to quickly cover some background information

OPS-16: How Do I Kill Thee?



Background (cont...)

- Self-service or shared memory clients:

"Self-service clients access the database directly through shared memory and not through servers, because server code is part of the self-service client process"
- Network or client/server clients:

"The network client accesses the database through a server process that the broker starts over a network connection."

OPS-16: How Do I Kill Thee?




OPS-16: How Do I Kill Thee?

Paul Koufalis


Background (cont...)

- Kill
 - Unfortunate and misleading name
 - Man page says it all: "Sends a signal to running processes."
 - "Hello Mr. PID #453982, here's a SIGHUP ."
 - Process has signal handler code to react appropriately
 - Some signals cannot be "handled"
 - Use "kill -l" to see a list on your system

10 OPS-16: How Do I Kill Thee? 


Background (cont...)

- Well-known signals:
 - SIGHUP (1): Hangup
 - SIGINT (2): Interrupt
 - SIGQUIT (3): Quit
 - SIGFPE (8): Floating Point Exception
 - SIGKILL (9): Kill (Untrappable)
 - SIGTERM (15): Terminate
 - SIGUSR1 (??): User-defined
 - **DANGER**: 16 on Solaris, 30 on AIX

11 OPS-16: How Do I Kill Thee? 

Background (cont...)

- Don't forget DASH (kill -15)
- On AIX, kill -15 or kill -SIGHUP is considered obsolete syntax
 - Use kill -s 15 or kill -s SIGHUP
- On Solaris if you forget the dash you'll get a default kill
 - Kill 9 <pid> ⇔ kill -15 <pid>


12 OPS-16: How Do I Kill Thee? 

OPS-16: How Do I Kill Thee?

Paul Koufalis


Background (cont...)

- VST's: Virtual System Tables
 - Contain real-time information
 - Stored in shared memory only
 - Start with "_" (ex.: _CONNECT)
 - Do not confuse with metaschema tables like _FILE and _FIELD

13 OPS-16: How Do I Kill Thee? 


Background (cont...)

- Traps
 - “Runs the specified command when the shell receives the specified signal or signals”
 - Often found in user or global profile
 - Shell level traps hide signals from running processes
 - “Just say no” in the Progress world

14 OPS-16: How Do I Kill Thee? 

Where is the Danger?

- Changes to certain objects in shared memory cannot be undone
 - A latch is used to reserve these objects during modification
- If a user dies holding a latch:
 - What did he change? Was it partial?
 - DB Manager brings the DB down to ensure integrity

15 OPS-16: How Do I Kill Thee? 

OPS-16: How Do I Kill Thee? Paul Koufalis

Myths and Misconceptions

- Careful when reading discussions on Internet forums
 - Some people are more knowledgeable than others
 - A lot of misinformation gets propagated



Myth #1: Killing a Process = Abnormal Shut

- Many different processes have client code
 - `_progres`: basic client
 - `_mprosrv` & `_sqlsrv2`: servers
 - `_proapsv`: AppServer™
- Killing one not necessarily fatal...
 - Probably not a good idea to kill a server process!



Myth #2: 1 Kill, 2 Kill, 3 Kill...All the Same

- Uhh...no
- If a process is not responding to a signal it's either
 - Hung
 - Busy (and hence ignoring you)
- Repeatedly killing a busy process is a no-no



OPS-16: How Do I Kill Thee?

Paul Koufalis

Myth #3: Kill -8 Is Safe

- Some people think kill -8 is a safe, final and effective way to kill a Progress process
 - Final: sometimes
 - Effective: sometimes
 - Safe: no
 - To quote Tom Bascom:
"Kill -8 (SIGFPE) varies in behavior depending on the release of Progress. In some releases it just acts like an unhandled signal...which is essentially the same as kill -9"



19 OPS-16: How Do I Kill Thee?

Myth #4: Kill -9 Is Safe

- What about kill -9?
 - Final: yes
 - Effective: yes
 - Safe: no
- It gets the job done, but it's going to leave one heck of a mess
 - Make sure your *curriculum vitae* is up to date



20 OPS-16: How Do I Kill Thee?

Don't Forget

- Our main goal is to kill a Progress session *safely*
- If the process refuses to die, live with that
 - Find another solution
 - Do NOT risk bringing down production
 - You think this would be obvious, wouldn't you?



21 OPS-16: How Do I Kill Thee?


OPS-16: How Do I Kill Thee?

Paul Koufalis

Killprosession

- Combination of KSH script and OpenEdge ABL code
 - killprosession.sh and killprosession.p
 - KSH script handles the UNIX side
 - ABL code queries real-time information in VSTs


22 OPS-16: How Do I Kill Thee?



Killprosession

- Outline:
 1. Validate PID and confirm destruction
 2. List the DB's to which the process is connected
 3. Send a few signals
 4. Monitor the process' reaction
 5. Disconnect the process from any remaining connected databases
 6. Wait and monitor some more


23 OPS-16: How Do I Kill Thee?



Step 1: Validate PID and Confirm

- Make sure the PID exists
- Make sure you didn't accidentally pass 1 as the PID
 - 1 is the "init" process
 - And you thought bringing the DB down would be bad for your career!
- Make sure the PID has no children
 - This is often overlooked

24 OPS-16: How Do I Kill Thee?



OPS-16: How Do I Kill Thee?

Paul Koufalis

Validate PID and Confirm (cont...)

```
# killprosession.sh 59272
2005/06/19-22:49:59 Child process exists:
  UID  PID  PPID  C  STIME  TTY  TIME CMD
  koup 375748 59272 0 22:49:49 pts/0 0:00 /usr/bin/ksh
2005/06/19-22:49:59 Please kill all child PIDs first
2005/06/19-22:49:59 ***** KILL IGNORED FOR 59272
```



25 OPS-16: How Do I Kill Thee?

Validate PID and Confirm (cont...)

- Show the process and arguments to the user for confirmation

```
# killprosession.sh 59272
koup 59272 pts/0 _progres -pf /usr/local/etc/prod.pf
Please confirm the kill of this session (y/n):
```



26 OPS-16: How Do I Kill Thee?

Step 2: Get List of Connected DBs

- Numerous ways to do this:
 - Look in PF (not 100%)
 - Look at command line (not 100%)
- Must look at `_CONNECT` of every running DB
 - Use `ps -ef | grep _mprosv | ...` to get list of running databases
 - Killprosession.p will confirm/deny connection



27 OPS-16: How Do I Kill Thee?

OPS-16: How Do I Kill Thee? Paul Koufalis

Step 3: Signal the Process

- Killprosession attempts to emulate DB Manager at shutdown:
 - First send a SIGEMT
 - Just a “wake up!”
 - Discovered polluting db.lg files in 9.1D09
 - Next, send a SIGINT
 - Should raise a STOP condition in ABL code
 - Bring user back to startup procedure (-p ...)
 - Finally, send a SIGHUP



Sending Signals (cont...)

- At this point, most well-behaved processes should be gone
- Do not be impatient!
 - Resist repeating the kill or sending a “stronger” signal
- VSTs should explain what’s going on



Example Log

```
lavf 490384 pts/l10 /opt/dlc/bin/_progres -pf
/usr/local/etc/prod.pf

Please confirm the kill of this session (y/n):
2005/01/28-10:07:36 Kill -SIGEMT executed. Wait 5 sec
2005/01/28-10:07:41 Kill -SIGINT executed. Wait 5 sec
2005/01/28-10:07:46 Kill -SIGHUP executed. Wait 10 sec
2005/01/28-10:07:56 Waiting for end of session for DB
/db/prod.db
```



OPS-16: How Do I Kill Thee?

Paul Koufalis

Step 4: Monitor VSTs

- ABL code loops every few seconds checking VSTs
 - `_CONNECT._CONNECT-DISCONNECT`
 - Disconnect initiated (i.e. signal received)
 - `_CONNECT._CONNECT-TRANS-ID`
 - Process in a transaction
 - `_CONNECT._CONNECT-RESYNC`
 - Process rolling back

31 OPS-16: How Do I Kill Thee?



Monitoring VSTs

- `_CONNECT._CONNECT-INTERRUPT`
 - Process interrupted by a signal
- `_CONNECT._CONNECT-WAIT`
 - Process waiting for some resource
- `_LATCH._LATCH-ID`
 - Process holding shared memory latches
- `_USERIO._USERIO-DBACCESS, _USERIO-BIREAD, _USERIO-BIWRITE`
 - Process doing DB I/O if values change

32 OPS-16: How Do I Kill Thee?



Monitoring PID

- Also check if CPU time is changing:
 - `ps -o "time=" -p <pid>`

33 OPS-16: How Do I Kill Thee?




OPS-16: How Do I Kill Thee?

Paul Koufalis


Interpreting VST Information

- All is well if:
 - Process raised the disconnect and resync flag
 - Just wait for rollback to finish
- Don't touch:
 - If latch list is non-blank
- Otherwise
 - Process hung for real
 - Proceed slowly and carefully

34 OPS-16: How Do I Kill Thee? 


Interpreting VST Information

- No need to memorize this presentation
 - Killprosession will advise accordingly
- Sample messages:
 - "Process still rolling back a transaction. Do not try and kill this process!"
 - "Process not using any CPU or doing any DB IO"

35 OPS-16: How Do I Kill Thee? 

Example Log

```
2005/01/28-10:07:56 Waiting for end of session for DB
/db/prod.db
WARNING : No user disconnect seems to have been
initiated
INFO : Process in transaction 854
INFO : Process NOT attempting to roll back a
transaction
INFO : Old Latch List:
INFO : New Latch List: 2 9
INFO : Database I/O in last 10 seconds : 366
INFO : CPU Time in last 10 seconds : 4 secs
***** SLEEP 10 seconds
*****
<Parts of log snipped>
INFO : CPU Time in last 10 seconds : 0 secs
INFO : No change in CPU use or DB I/O
```


36 OPS-16: How Do I Kill Thee? 

OPS-16: How Do I Kill Thee?

Paul Koufalis

Step 5: Disconnect


- Finished waiting
- The process is non-responsive to signals
 - Killprosession will stop here if necessary
- Next step:
 - Try to disconnect the user from the databases



37 OPS-16: How Do I Kill Thee?

Disconnect

- Get list of connected DBs and associated user-ids
 - Again: provided by killprosession ABL code
 - Might have changed since initial listing
- Use "proshut -C disconnect <usernum>"




38 OPS-16: How Do I Kill Thee?

Example Log

```
2005/01/28-10:08:47 Process not using and CPU or doing any DB IO
2005/01/28-10:08:49 Disconnecting user 54 from /db/prod.db
2005/01/28-10:08:49 Disconnecting user 592 from /db/edi.db
2005/01/28-10:08:50 Disconnecting user 54 from /db/help.db
2005/01/28-10:08:50 All db disconnects attempted
2005/01/28-10:08:50 Pausing 10 seconds

2005/01/28-10:09:03 Process no longer connected to any databases
```



39 OPS-16: How Do I Kill Thee?

OPS-16: How Do I Kill Thee?

Paul Koufalis

Still not gone...

- Much to the dismay of many a system administrator, the safest thing to do is to wait some more
 - The process may still be rolling back
 - The process may still be doing some I/O
 - Or maybe it's just really, really frozen
- In all cases killprosession will tell you



Step 6: Open Files

- Look at what resources the process is using
- Isof: List Open Files
 - Does the process have any DB files open?
- svmon: Snapshot Virtual memory Monitor
 - AIX only (maybe "pmap" on Solaris?)
 - Is the process attached to any database shared memory segments?



List Open Files (Isuf)

- Requires root access

```
# isof -p 59272
COMMAND  PID USER  FD  TYPE  DEVICE  SIZE/OFF  NODE NAME
_progress 59272 koup  cwd  VDIR  61,5    1536 2130019 /home (/dev/lvhome)
_progress 59272 koup  0u   VCHR  30,0    0t38852 41094 /dev/pts/0
_progress 59272 koup  1u   VCHR  30,0    0t38852 41094 /dev/pts/0
_progress 59272 koup  2u   VCHR  30,0    0t38852 41094 /dev/pts/0
_progress 59272 koup  3c   VREG  61,2    1134729 149092 /opt/ (/dev/lvopt)
_progress 59272 koup  6w   VREG  64,2    6771 901150 /db (/dev/lvdb)
```

- STOP: A file is open /db!



OPS-16: How Do I Kill Thee?

Paul Koufalis

Virtual Memory Snapshot (svmon)

- Also requires root

```
# svmon -P 59272 | grep "shared memory segment"
16244 3 work shared memory segment - 25394 0 0 25394
6d12b 6 work shared memory segment - 21306 0 0 21306
6ffe4 4 work shared memory segment - 5978 0 0 5978
```

- Check if DB shared memory segment
 - Killprosession compares process shmem to server shmem

33 OPS-16: How Do I Kill Thee?



Example Log

```
2005/01/28-10:09:07 Checking attached shared memory segments
2005/01/28-10:09:07 There should be no attached shared memory segments

2005/01/28-10:09:07 Attached shared memory segments:

2005/01/28-10:09:07 Listing all matching database shared memory segments:

If there were no open database files NOR attached database shared
memory segments then the process can be killed with a kill -8
Otherwise call Progress technical support.
```

- I would kill -8 this process
 - Remember – YMMV!

34 OPS-16: How Do I Kill Thee?



Step 7: Stronger Kill

- If the process has:
 - no DB files open
 - no DB shared memory segments open
- ...it may be safe to issue a stronger kill
 - Proceed with caution

35 OPS-16: How Do I Kill Thee?



OPS-16: How Do I Kill Thee? Paul Koufalis

Stronger Kill

- Send a SIGUSR1
 - Will generate a PROTRACE file
- Send a SIGFPE
 - Floating-point exception *may* be handled more safely than a completely untrappable SIGKILL
 - Probably not...



36 OPS-16: How Do I Kill Thee?

...or Do Nothing

- If process still has DB files and/or shared memory segments open
 - Do nothing
 - Take note to SIGKILL at next planned DB shutdown
- If latch list is consistently empty SIGFPE *may* be safe
 - Consider the risk/reward



37 OPS-16: How Do I Kill Thee?

In Summary

- It *is* possible to safely kill an OpenEdge shared-memory client on UNIX
- Be patient
- Use a script to eliminate dangerous improvisations




38 OPS-16: How Do I Kill Thee?

OPS-16: How Do I Kill Thee?
Paul Koufalis

Relevant Exchange Sessions

- OPS-28: A New Spin on Some Old Latches
 - Get the real scoop from the inside guy: Rich Banville
- OPS-08: Alerts, Alarms, Pages and Harbingers of Trouble...
 - When Tom Bascom talks, you should listen

49 OPS-16: How Do I Kill Thee?




Questions ?

50 OPS-16: How Do I Kill Thee?



Thank You

51 OPS-16: How Do I Kill Thee?



OPS-16: How Do I Kill Thee?
Paul Koufalis