

99 Ways to Crash



PUG Challenge 2016

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White Star Software

A Few Words about the Speaker



-
- Nectar Daloglou; Progress & QAD since 2000.
 - Performed specialized services at more than 60 Progress customer sites:
 - Progress Database Administration
 - Install/Upgrades/Migrations of Progress and QAD Applications
 - Technical Audits / Performance Tuning
 - Business Continuity Strategies
 - Now part of White Star Software
 - Recently helped migrate 70 Progress environments from AIX to Linux



99 Ways to CRASH!

- Don't try this at home!
- Learn from mistakes of others
- Goal: Show you a crash you can prevent
- Crash: DB ceases to respond
- Why 99?

Agenda



- The “Human” Factor
- Database Management
- Operating System
- Beyond our control
- Questions



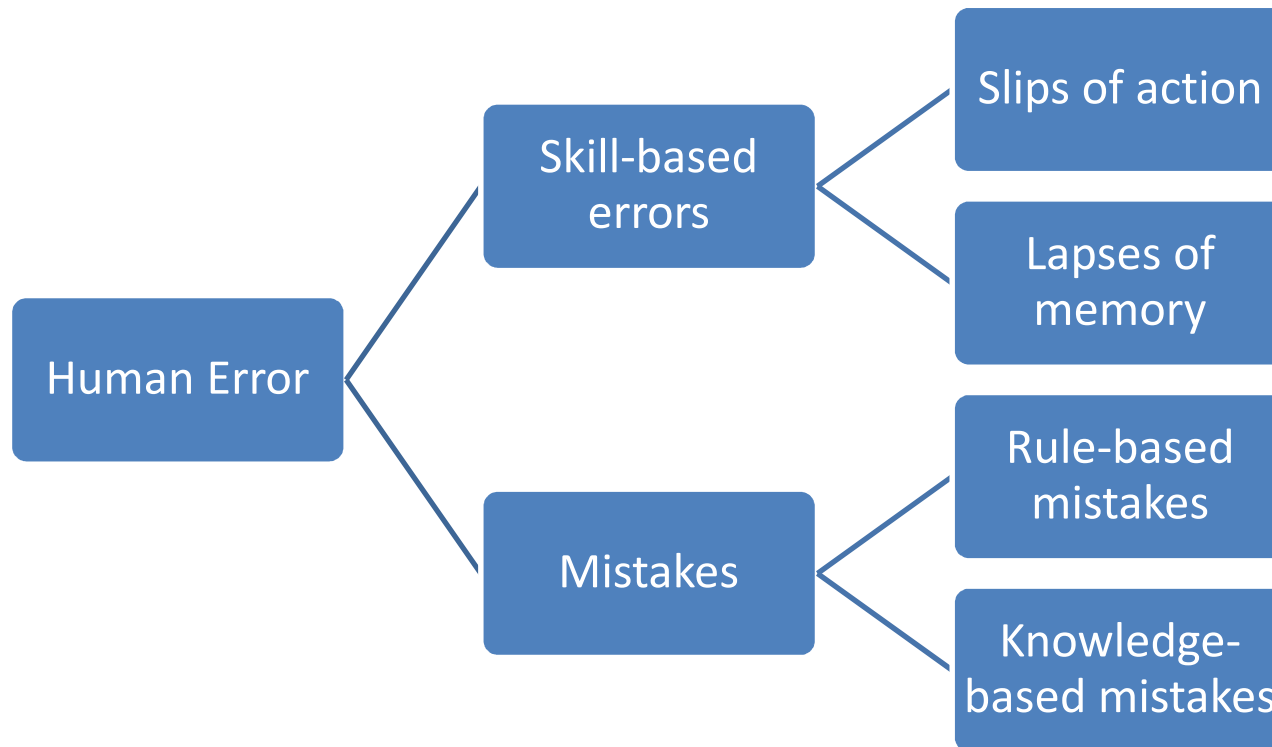
Human Error

Human error means that something has been done that was "not intended by the actor; not desired by a set of rules or an external observer; or that led the task or system outside its acceptable limits". **In short, it is a deviation from intention, expectation or desirability.**

Source: https://en.wikipedia.org/wiki/Human_error

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The Human Condition



Source: <http://www.hse.gov.uk/construction/lwit/assets/downloads/human-failure.pdf>



Accidental File Delete

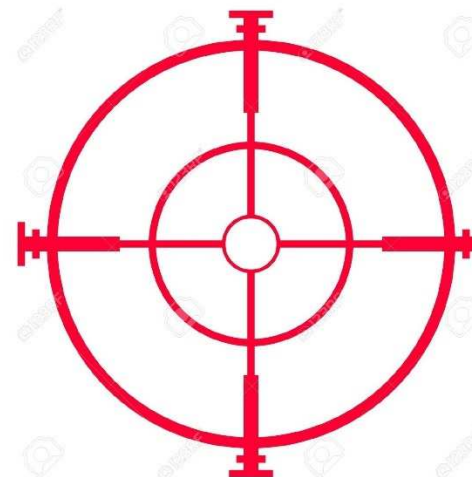
- Delete .d's (and .db, .d1, etc....whoops!):
 - `rm *.d*`
- Delete development environment
 - `rm -rf /dev*`
- Unintentional file redirect
 - `> _mprosrv db`



Accidental rm

- Use *root* or privileged user only when necessary
- List the files first

```
- ls filestodelete*  
- pwd  
/db/prod
```

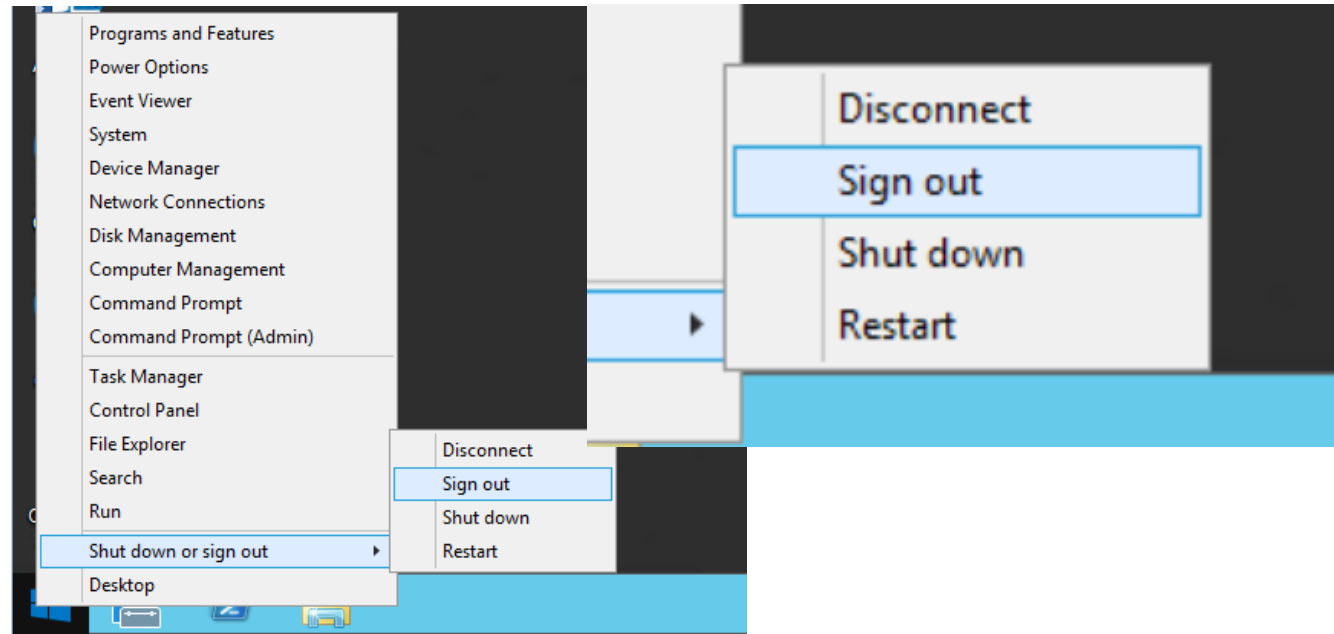


- Extra caution with root or privileged user

Accidental Server Shutdown



- Fat thumb:



Accidental Server Shutdown



- Communication breakdown between teams
 - “Unplanned” planned outage
 - Server decommission
- Point and click VM shut down



Monitor your servers' upstatus

- Use monitoring tool or scripts to poll server status and alert/page you (From another server!)

The screenshot displays the 'protop' monitoring dashboard. At the top, it shows 'Home > Dashboard', 'Last Update 2016/06/06 10:52:28', and 'Welcome, Demo User ABC'. The main content is divided into several panels:

- Resources:** A table with columns: Name, HB Age, Bkp Age, Alert Status, Cnx, Blocked, Trx, Cur Lk, BI Cts, Hit%, Log Rd, OS Rd, LatchTM, Io Resp. Visible rows include abc.abc_db7 and abc.abc_db8.
- Critical Alerts:** A panel showing a critical alert for '2016/06/06' at '00:05:04 abc.abc_db11' with the message 'No Heartbeat from qadprod01 since 2016/06/18 09:35:30.177'. A callout box provides a detailed view of this alert.
- Alerts Feed:** A panel showing a log of alerts for '2016/06/06', including 'ai_Empty Empty AI Extents 0 < 2' and 'pctAlloc Space used 122 > 85'.

Callout boxes provide detailed views of the critical alerts:

```
ai_Empty Empty AI Extents 0 < 2
[2016/06/06 06:41:59]
[server: MyServer]
[dbname: /db/prod/abc_db11]
[cfname: abc_db11]
```

```
2016/06/06
00:05:04 abc.abc_db11 No Heartbeat from qadprod01 since 2016/06/18 09:35:30.177
```



Proshut User Disconnect

- Disconnect a user safely

```
qaddba@protopdev:/data/eb21/db
[qaddba@protopdev:/data/eb21/db]
$ proshut mfgdemo
usr  pid  time of login  user id  tty  Limbo?
5   13497  Thu Jun 23 19:41:22 2016  APW     /dev/pts/1  no
6   13500  Thu Jun 23 19:41:22 2016  BIW     /dev/pts/1  no
7   13503  Thu Jun 23 19:41:22 2016  WDOG    /dev/pts/1  no
8   13741  Thu Jun 23 19:41:46 2016  nectar  /dev/pts/2  no
    1  Disconnect a User
    2  Unconditional Shutdown
    3  Emergency Shutdown (Kill All)
    x  Exit

Enter choice> █
```

Avoid Being Prone to Human Error



- Uh-oh!

```
qaddba@protopdev:/data/eb21/db
[qaddba@protopdev:/data/eb21/db]
$ proshut mfgdemo
usr      pid      time of login      user id      tty          Limbo?
 5    13497  Thu Jun 23 19:41:22 2016    APW         /dev/pts/1    no
 6    13500  Thu Jun 23 19:41:22 2016    BIW         /dev/pts/1    no
 7    13503  Thu Jun 23 19:41:22 2016    WDOG        /dev/pts/1    no
 8    13741  Thu Jun 23 19:41:46 2016    nectar      /dev/pts/2    no
      1  Disconnect a User
      2  Unconditional Shutdown
      3  Emergency Shutdown (Kill All)
      x  Exit

Enter choice> 2
Shutdown is executing. (1613)
```

Avoid Being Prone to Human Error



1. Remove the “2” key:

2. Or Use:

```
_mprshut db -C list
```

```
_mprshut db -C disconnect userid
```

Agenda



- The “Human” Factor
- Database Management
- Operating System
- Beyond our control
- Questions



Abnormal Shutdown

- Terminating a shared memory process holding latches will crash the database:

```
[2016/06/17@11:39:57.214-0400] P-241778      T-1      I WDOG      6: (2522)  User 22 died holding 1 shared
memory locks.
[2016/06/17@11:39:57.214-0400] P-241778      T-1      I WDOG      22: (5029) SYSTEM ERROR: Releasing
multiplexed latch. latchId: 3096224748304416
[2016/06/17@11:39:57.347-0400] P-1134704     T-1      I BROKER    0: (2249)  Begin ABNORMAL shutdown code 2
```

- A UNIX kill command or Windows End Task
- An excellent read on safe kill's & free kill script: "How do I kill thee":

http://www.wss.com/images/downloads/005_PTW_006_HowDoIKillThee.pdf



Abnormal Shutdown

- Killing an agent from OpenEdge Management

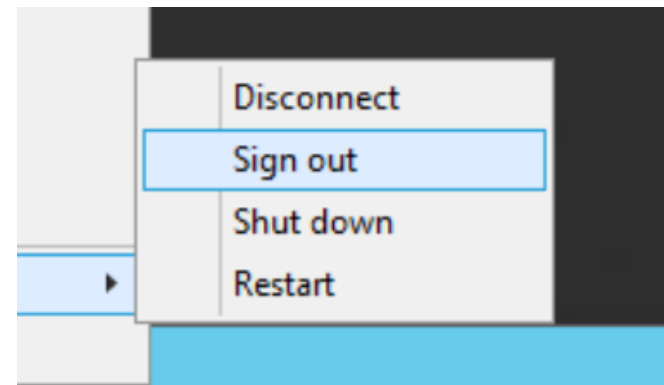
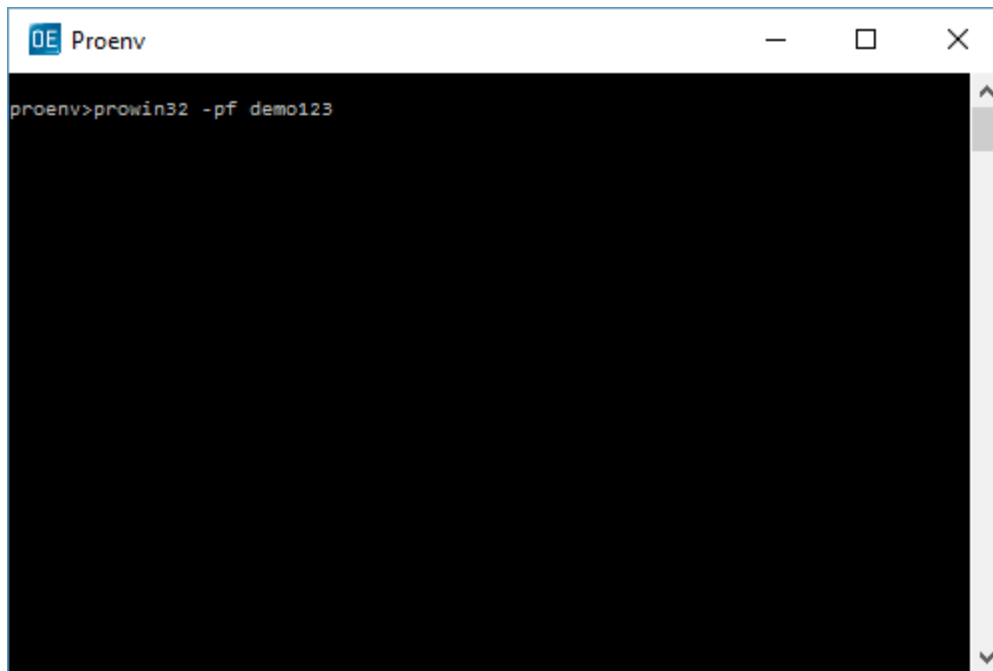
The screenshot shows the OpenEdge Management console interface. The top navigation bar includes 'My Dashboard', 'Alerts (5 unseen)', 'Resources', 'Library', 'Reports', 'Jobs', 'Options', and 'Help'. The left sidebar shows a tree view of resources, with 'c3PROD' expanded to show 'OpenEdge' and 'AppServer' sub-items. The main panel displays details for 'Server Pool Control: PROD.asbroker1' with a timestamp of 'Jun 23, 2016 8:26:49 PM' and 'Agent PID: 3355'. A red arrow points to a 'Kill' button. Below this, a 'Process summary' section lists various system metrics.

Process summary	
Process name:	/opt/progress_102b/dlc/bin/_proapsv -logginglevel 3 -logfile /opt/progress_102b/wrk_oe/asbroker1.server.log -ubpid 12594 -Ms 1 -logr logthreshold 0 -numlogfiles 3 -ASID 2 -ubpropfile /opt/progress_102b/dlc/properties/ubroker.properties -ipver IPv4 -pf /smsusp/pms/s
Process start time:	Mon Jun 20 09:30:00 2016 (3 days, 10 hours, 56 mins, 50 secs)
User id:	10471(dbmanage)
Group id:	10050(ds2000)
Parent pid:	12594
Process statistics - Time since last scheduled poll: 3 days, 10 hours, 56 mins, 50 secs	
Resident size:	201412.0 Kbytes
Virtual size:	962048.0 Kbytes
CPU:	0.01 (0.0)%
Weighted CPU:	0.0 (0.0)%
User time:	28.0 secs (28.0 secs)
Kernel time:	0.0 secs (0.0 secs)
Process time:	28.0 secs (28.0 secs)

Abnormal Shutdown



- Closing a shared-memory window or logging off from Windows





Windows Log off

- Logging off / Signing out from Windows will effectively terminate all your Progress running processes:
 - Example: `_mprosrv`; `replserver`; `prowin32`, etc..
- Use OpenEdge Explorer, dbman, or Task Scheduler to run server processes in background



Excessive BI Growth

- Oops! No –bistall or -bithold:

```
[2014/08/14@16:05:03.105+0200] P-2300      T-4592  I ABL      8: (10601) SYSTEM ERROR: Attempted to
exceed maximum size on file \prod\prod.b2.
[2014/08/14@16:05:03.120+0200] P-2300      T-4592  F ABL      8:
(854)  ** Insufficient disk space to extend the before-image file.
[2014/08/14@16:05:03.167+0200] P-3360      T-604   I SRV      3: (2520)  Stopped.
[2014/08/14@16:05:03.214+0200] P-464    T-660   I SRV      2: (2520)  Stopped.
[2014/08/14@16:05:03.214+0200] P-2304    T-2312  I SRV      1: (2520)  Stopped.
[2014/08/14@16:05:03.245+0200] P-3320    T-776   I SRV      4: (2520)  Stopped.
[2014/08/14@16:05:04.261+0200] P-2300    T-4592  I ABL      8: (5028)  SYSTEM ERROR: Releasing
regular latch. latchId: 4
[2014/08/14@16:05:04.261+0200] P-2300    T-4592  I ABL      8: (5028)  SYSTEM ERROR: Releasing
regular latch. latchId: 1
[2014/08/14@16:05:04.261+0200] P-2300    T-4592  I ABL      8: (453)   Logout by batch on CON:.
[2014/08/14@16:05:04.433+0200] P-736    T-2784  I ABL      9: (453)   Logout by batch on CON:.
[2014/08/14@16:05:04.511+0200] P-2496    T-2500  I BROKER   0: (2249)  Begin ABNORMAL shutdown code
2
[2014/08/14@16:06:05.511+0200] P-2496    T-2500  I BROKER   0: (2251)  Destroyed user 10 pid 3236.
[2014/08/14@16:06:06.511+0200] P-2496    T-2500  I BROKER   0: (2527)  Disconnecting dead user 10.
[2014/08/14@16:06:08.527+0200] P-2496    T-2500  I BROKER   : (334)   Multi-user session end.
```



Excessive BI Growth

- Possible Causes:
 - Largely scoped transactions
 - Long running transactions
 - Bad Code
- Consider:
 - -bistall -bithold
 - Monitor long transactions and BI size
- 90% Warning in .lg not always enough notice:

```
[2015/02/25@12:57:10.468+0800] P-7475      T-140691071489824 I ABL    55: (9240) BI File size has  
grown to within 90 percent of the threshold value of 2.0  GBytes.  
[2015/02/25@13:04:21.953+0800] P-21931    T-139708899522336 I ABL    58: (9239) BI File Threshold  
size of 2.0  GBytes has been reached.  
[2015/02/25@13:04:21.953+0800] P-21931    T-139708899522336 I ABL    58: (6560) Forward processing  
stalled until database administrator intervention.
```

Cannot Switch to Empty AI Extents



- Again no stall (-aistall)

```
[2008/03/04@18:39:35.796-0500] P-868468      T-1      I Usr      46: (3773)  Can't switch to after-  
image extent /reg04/dbs/ai/qadprd04.a1 it is full.  
[2008/03/04@18:39:35.799-0500] P-913610      T-1      I FMAGENT11: (453)  Logout by DB_Agent on  
/dev/pts/50.  
[2008/03/04@18:39:35.803-0500] P-868468      T-1      I Usr      46: (5350)  Database Server shutting  
down as a result of after-image extent switch failure.  
[2008/03/04@18:39:35.826-0500] P-3633292      T-1      I RPLS      5: (10672) The Source database is  
crashing.  Fathom Replication cannot continue.
```

Cannot Switch to Empty AI Extents



- Possible Causes:
 - AI management script or AIMGMT process not running
 - Out of disk space
 - OE Replication: Not synced to target DB(s); AI files “Locked”
- Consider:
 - -aistall
 - Use AIMGMT utility
 - Monitor empty extents and AI archive disk space

ProTop AI Alert



protop Home > Dashboard Last Update 2016/06/06 10:52:28 Welcome, Demo User ABC

Name	HB Age	Bkp Age	Alert Status	Cnx	Blocked	Trx	Cur Lk	BI Cls	Hit%	Log Rd	OS Rd	LatchTM	io Resp
abc.abc_db7	00:00:56	10:11	6	8	0	0	0	0	100.00%	9			
abc.abc_db8	00:01:56	10:08	6	39	0	1	0	0	100.00%	721			
abc.abc_db12	00:00:56	10:08	6	7	0	0	0	0	100.00%	0	0	0	0.35
abc.abc_db10	00:01:56	10:43	7	10	0	1	0	0	100.00%	3,494	0	0	0.39

Critical Alerts

2016/06/06

00:05:04 abc.abc_db11 (3775) Can't switch to after-image extent /ai/adext/cus...

Alerts Feed

2016/06/06

```
ai_Empty Empty AI Extents 0 < 2
[2016/06/06 06:41:59]
[server: MyServer]
[dbname: /db/prod/abc_db11]
[ofgname: abc_db11]
```

09:28:34 abc.abc_db10 pctAlloc Space used 122 > 85
09:28:32 abc.abc_db10 excessldx -27 < 10
09:28:29 abc.abc_db10 lkTableSize 10016 < 50000
09:28:24 abc.abc_db10 rnxPerServ 100 > 5

OE Replication: Stall by Full –pica queue



- Communication queue between the RDBMS and the replication server
- Full queue causes a performance stall
- Restarting the replication server will flush queue
- Monitor using Promon:

– R&D>1>16

```
10/18/08      Status: Database Service Manager
00:20:44
Communication Area Size :      1000000.00 KB
Total Message Entries   :      9142822
Free Message Entries    :                      914
Used Message Entries    :      9141908
Service Latch Holder    :                -1
```

- Or get alerted by ProTop

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Calculating -pica

-pica = (Total AI Writes/Block count) * 1.25

Total AI writes can be determined with promon

promon → R&D → Option 2 (Activity) → Option 6 (AI Log)

*Note: Gather Total AI writes at the busiest update portion of the day

Block count in version 10+ = 9.16

When in doubt set it larger (memory is cheap)



Maximum value for -pica

256 (9.1E, 10.0B, 10.1A),
1024 (9.1E04),
512 (10.0B05),
8192 (10.1A02, 10.1B01),
1000000 (10.2B08, 11.2, and 11.3)



2GB File Limit

- Large Files Not Enabled:

```
[2008/11/26@05:58:42.846-0500] P-2510996 T-1 I Usr 6: (10601) SYSTEM
ERROR: Attempted to exceed maximum size on file /reg03/dbs/dev3/qaddev3_11.d2.
[2008/11/26@05:58:42.874-0500] P-2510996 T-1 F Usr 6: (8897) SYSTEM ERROR: Unable to extend
database within area HISTORY.
[2008/11/26@05:58:43.710-0500] P-2510996 T-1 I Usr 6: (2252) Begin transaction backout.
[2008/11/26@05:58:43.710-0500] P-2510996 T-1 F Usr 6: (2255) SYSTEM ERROR: Incomplete
microtransaction.
[2008/11/26@05:58:43.711-0500] P-2510996 T-1 I Usr 6: (439) ** Save file named core for
analysis by Progress Software Corporation.
[2008/11/26@05:58:43.888-0500] P-2211938 T-1 I BROKER 0: (2249) Begin ABNORMAL shutdown code 2
```

Use: proutil <DB> -C EnableLargeFiles



No variable extent

- Similar issues when fixed extent fills up:

```
[2008/11/26@05:58:42.846-0500] P-2510996 T-1 I Usr 6: (10601) SYSTEM
ERROR: Attempted to exceed maximum size on file /reg03/dbs/dev3/qaddev3_11.d2.
[2008/11/26@05:58:42.874-0500] P-2510996 T-1 F Usr 6: (8897) SYSTEM ERROR: Unable to extend
database within area HISTORY.
[2008/11/26@05:58:43.710-0500] P-2510996 T-1 I Usr 6: (2252) Begin transaction backout.
[2008/11/26@05:58:43.710-0500] P-2510996 T-1 F Usr 6: (2255) SYSTEM ERROR: Incomplete
microtransaction.
[2008/11/26@05:58:43.711-0500] P-2510996 T-1 I Usr 6: (439) ** Save file named core for
analysis by Progress Software Corporation.
[2008/11/26@05:58:43.888-0500] P-2211938 T-1 I BROKER 0: (2249) Begin ABNORMAL shutdown code 2
```

- Ensure every area has a variable extent:

```
d "TRGLDET":27,64 ./db f 512000
d "TRGLDET":27,64 ./db
#
d "TRGLDET_IDX":28,32 ./db f 512000
d "TRGLDET_IDX":28,32 ./db
```



Infinite (-l) increases

- Process eventually consumed all the memory

```
[2014/03/17@12:02:46.754-0400] P-8573096 T-1 I ABL 140: (5408) WARNING: -l exceeded. Automatically increasing from 3323700 to 3323710.  
[2014/03/17@12:02:46.760-0400] P-8573096 T-1 I ABL 140: (5408) WARNING: -l exceeded. Automatically increasing from 3323710 to 3323720.  
[2014/03/17@12:02:46.767-0400] P-8573096 T-1 I ABL 140: (5408) WARNING: -l exceeded. Automatically increasing from 3323720 to 3323730.  
[2014/03/17@12:02:46.773-0400] P-8573096 T-1 I ABL 140: (5408) WARNING: -l exceeded. Automatically increasing from 3323730 to 3323740.
```

- Monitor and consider -hardlimit



Lock Table Overflow (-L)

- Hitting the max will eventually consume all shared memory

```
Begin transaction backout. (2252)
Lock table overflow, increase -L on server (915)
Out of free shared memory. Use -Mxs to increase. (6495)
SYSTEM ERROR: mtlatch <latch-num>, holding <lock>. (3712)
SYSTEM ERROR: Releasing regular latch. latchId:<latch-num> (5028)
SYSTEM ERROR: Releasing multiplexed latch. latchId:<latch-num>
(5029)
User <num> died holding <num> shared memory locks. (5026)
```

- Monitor open transactions and record lock counts
- Use: `proutil db -C increaseto -Mxs #`



Failed DB File Move

- mv /db/prod.d1 /db1/prod.d1
- prostrct repair prod
- Oops! What happened?

```
----- Error -----
      Last open date mismatch. (9215)
    Extent has a different last opened date Fri Jun
      24 00:40:39 2010, (9213)
Control Area has a last open date of Fri Jun 24 00:41:08 2010. (9217)
      Probable backup/restore error. (605)
    Database is damaged, see documentation. (1486)

-----
      <OK>
```

- Rename .db before and after, to prevent accidental logins



No integrity (-i) crash

- Prepare to restore

```
qaddba@protopdev:~/temp
```

```
----- Error -----  
** The last session was run with the no integrity (-i) parameter. (509)  
-----  
      <OK>  
-----  
** Your database cannot be repaired. You must restore a backup copy. (510)
```

Using proutil -F Forced Access



```
----- Error -----  
** Your database was damaged. Dump its data and reload it. (37)  
-----  
<OK>
```

- Back up DB beforehand
- Should be used as a last resort
- Used to extract and salvage as much data as possible
- Use ASCII Dump/Load

Agenda



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Linux Out of Memory Killer

- A self-preservation mechanism that terminates a process when memory is over committed.
- OOM will kill the most memory consuming process

`/var/log/messages:`

```
Oct 22 16:05:48 s619784dc3vl42 kernel: Out of memory: Kill process 5995 (_mprosrv) score 421 or sacrifice child
```

```
Oct 22 16:05:48 s619784dc3vl42 kernel: Killed process 5995, UID 65535, (_mprosrv) total-vm:34767444kB, anon-rss:12680kB, file-rss:31617936kB
```

- Can control likelihood by setting `oom_adj` (Valid range -16 to +15; -17 to exempt:
 - Example: `echo -17 /proc/5995/oom_adj`



Host name Change

- A simple host name change:

```
> hostname slv8002
[2008/09/24@08:28:48.790-0400] P-10817782 T-1 I BROKER 0: (4192) /reg01/dbs/qadddb/qadprd01.lk:
HOSTNAME is slv8002, expected slv8000.
[2008/09/24@08:28:48.790-0400] P-10817782 T-1 I BROKER 0: (4196) /reg01/dbs/qadddb/qadprd01.lk is not
a valid .lk file for this server.
[2008/09/24@08:28:48.790-0400] P-10817782 T-1 I BROKER 0: (2249) Begin ABNORMAL shutdown code 2
```

- .lk file contains host

```
> cat qadprd01.lk
slv8000
```



Out of disk space

- Out of disk space

```
[2016/05/04@00:31:13.741+0800] P-14609      T-139953801205536 I ABL      23: (9450)  bkiowrite:Insufficient
disk space during write, fd 119, len 16384, offset 13520, file /reg12/dbs/ai/r12prd3.a1.
[2016/05/04@00:31:13.741+0800] P-14609      T-139953801205536 I ABL      23: (9450)  bkiowrite:Insufficient
disk space during write, fd 119, len 16384, offset 13520, file /reg12/dbs/ai/r12prd3.a1.
[2016/05/04@00:31:13.741+0800] P-14609      T-139953801205536 I ABL      23: (9450)  bkiowrite:Insufficient
disk space during write, fd 119, len 16384, offset 13520, file /reg12/dbs/ai/r12prd3.a1.
[2016/05/04@00:3[2016/05/04@00:31:35.563+0800] P-14609      T-139953801205536 I ABL      23: (4163)
Insufficient disk space.
```

- Monitor disk space
- Track database growth rate
- Segregate DB files from application, home/work directories
- Do not store anything under / <root> or C:\



Unintended Java update

- A Linux Kernel patch updated java
 - Used to be: `/usr/java/jdk1.5.0_22/`
 - Now `/usr/java/jdk1.6.0_10`
 - Progress likes its java a certain way

Agenda



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Hardware Failure

```
SYSTEM ERROR: wrong dbkey in block. Found <dbkey1>, should be <dbkey2> (1124)
SYSTEM ERROR: read wrong dbkey at offset <offset> in file <file> found <dbkey>, expected <dbkey>, retrying. (1152)
SYSTEM ERROR: read wrong dbkey at offset <offset> in file <file> found <dbkey>, expected <dbkey>, retrying. (9445)
SYSTEM ERROR: Database block <nbr> has incorrect recid: <nbr>. (355)
SYSTEM ERROR: wrong dbkey (1067)
BROKER 0: rlrndxt: note prefix and suffix lengths don't match 8224 48
SYSTEM ERROR: The broker is exiting unexpectedly, beginning Abnormal Shutdown. (5292)
```

- Disk Subsystem
 - SAN Controller
 - RAID Controller
- CPU
- RAM
- Power Supply
- Motherboard
- UPS
- Network



Other Disasters

- Natural Disaster/Extreme Weather
- Power outage
- Flood
- Fire
- Utility outage (Excluding Fire)
- Cyber attack
- Supply chain distribution
- Terrorist event
- Employee health and safety incident
- Epidemic/Pandemic
- Sabotage
- Environmental accident
- Others...

Review/Update Business Continuity Plan





Progress Bugs

- **Database crash after Lock Table Overflow**

```
Lock table overflow, increase -L on server (915)
Begin transaction backout. (2252)
Transaction backout completed. (2253)
SYSTEM ERROR: mtlatch <latch-num>, holding <lock>. (3712)
SYSTEM ERROR: mtlatch 7, holding 0x40. (3712)
** Save file named core for analysis by Progress Software Corporation. (439)
```

- **Truncate after Emergency Shutdown corrupts BI**

```
rmUndoLogicalChange: recid <RECID> area <Areamum> txn <Transnum> updctr <n>
rmFetchRecord returns <n1> expected <n2>
```

- **LKRELS Errors in 10.1B**

```
SYSTEM ERROR: lkrels record <recid> not locked. (435)
```



Stay current

- Stay current with your OpenEdge version:

Product Version & Current Service Pack (SP)	Life Cycle by Product Release		
	Active	Mature	Retired
OpenEdge 11.6.1	2015-Oct	-	-
OpenEdge 11.5.1	2014-Dec	2015-Oct	2018-Oct (T)
OpenEdge 11.4.0	2014-Aug	2014-Dec	2017-Aug (T)
OpenEdge 11.3.3	2013-Jul	2014-Aug	2016-Jul (T)
OpenEdge 11.2.1	2013-Feb	2013-Jul	2016-Feb
OpenEdge 11.1.0	2012-Jun	2013-Feb	2014-Feb
OpenEdge 11.0.0	2011-Dec	2012-Jun	2013-Jun
OpenEdge 10.2B.08	2009-Dec	2011-Dec	tbd
OpenEdge 10.2A	2008-Nov	2009-Dec	2010-Feb
OpenEdge 10.1C	2008-Feb	2009-Aug	2014-Jul
OpenEdge 10.1B	2006-Dec	2008-May	2008-May
OpenEdge 10.1A	2005-Dec	2007-Mar	2007-Mar
OpenEdge 10.0B	2004-Aug	2006-Mar	2006-Mar
OpenEdge 10.0A	2003-Dec	2004-Nov	2004-Nov
Progress V9.1E	2004-Nov	2006-Nov	2015-Oct
Progress V9.1D	2002-May	2005-Feb	2005-Feb
Progress V8.3E	2001-Dec	2002-Mar	2010-Feb
Progress V8.3D	2000-Jan	2002-Mar	2002-Mar

BONUS!



-
- Ensure you have a valid backup
 - Not valid if it's not tested



Conclusion

- Human errors can be managed with some situational awareness and behavior change
- A good monitoring and alerting tool can help avoid outages
- Stay current and learn to avoid DB crashes
- Have an up-to-date disaster recovery plan (And good backup!)

Questions?

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Questions



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- Questions or comments? Feel free to e-mail me:

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Thank You!

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