

# SQL in a 4GL World



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# The speaker

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- Speaker/teacher/OpenEdge DBA since 1994



<https://protop.com>

# Agenda

- Prepare
- Connect
- Query
- Correct and optimize
- Q&A

<https://protop.com>

# Prepare

- How many SQL connections are you expecting to support?
- What will they be doing?
  - Extractions?
  - Simple lookups?
  - Create/Update/Delete?
- What is the expected load?
  - Whatever you think, multiply by TEN

# Supporting new SQL connections

- Must configure database broker to accept SQL connections
  - WITHOUT impacting 4GL connections !!
- Start a secondary login broker with the -m3 startup parameter
  - Listening on a different TCP port
- Specify -ServerType SQL to only accept SQL connections on this broker
- Specify -ServerType 4GL on the *other* broker to prevent SQL connections

# Supporting new SQL connections

- Use at least two SQL server processes to service the SQL connections
  - SQL server is multi-threaded
- Split the expected user connection count across the two servers. This will support 50 SQL connections:

```
_mprosrv sports -m3 -S spsql -Mpb 2 -Mi 1 -Ma 25 -ServerType SQL
```

# CAREFUL

- The new users, servers and brokers must be accounted for in the primary broker startup
- -Mn: Add the new -Mpb value and round up to the next 5 or 10 ( i.e if you calculate -Mn 78, round to -Mn 85)
- -n: Add the total number of new connections (50) AND the total number of new servers and round up to give yourself a buffer
  - Old -n: 500      New -n:  $500 + 3 \text{ (servers)} + 50 \text{ (cnx)} = 553 \rightarrow 600$



# What will they be doing?

- If querying mass data, they will pollute -B and affect regular users
  - Latching and latch waits will also increase proportionally
  - CPU and disk usage could also increase significantly
- If C/U/D, watch out for locking and transaction scope
- Adjust startup parameters accordingly or offload queries to OE Replication target

# More on load

- It's always more than you expect
- It always grows, as the consumers want more and more data from the primary system
- Again, consider offloading
  - OE Replication Target
  - Pro2, CDC or similar replication tools

## About those users...

- They need to authenticate
- Typically against `_USER` system table
- If you don't have `_USER` records nor some other configured authentication domain, then **any combination of user/pwd will be accepted as authentication**

## Users continued...

- 4GL does not have the concept of a “DBA”
- SQL does
- By default, the SQL DBAs are “sysprogress” and the Win/UNIX user account that created the DB
  - Combine that with no \_USER records, and you have a big security hole
  - Easy to connect to DB and wreak havoc

# GRANTS

- By default, 4GL is wide open: full access to all data is available to everyone, whether authenticated or not
- SQL is the opposite: access is only granted to the owner of the data (by default sysprogress and the user that created the DB)
  - Any other access must be GRANT'ed

GRANT SELECT on "pub"."order-line" to 'paul';  
COMMIT;

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# Connect

- Progress provides ODBC and JDBC drivers from DataDirect
- Download from ESD
- Included with [almost?] any OE installation
- ODBC: via DLL
- JDBC: via jar file

<https://protop.com>

# ODBC

ODBC Progress OpenEdge Wire Protocol Driver Setup ? X

General Advanced Security Failover About

Data Source Name:  Help

Description:

Host Name:

Port Number:

Database Name:

User ID:

Test Connect OK Cancel Apply

ODBC Progress OpenEdge Wire Protocol Driver Setup ? X

General Advanced Security Failover About

Default Isolation Level: 1 - READ COMMITTED Help

Fetch Array Size: 50

Login Timeout: 15

Query Timeout: 0

Lock Wait Timeout:

Enable Timestamp with Time Zone  TCP Keep Alive

Use Wide Character Types

Extended Options:

Test Connect OK Cancel Apply

# JDBC

- Add openedge.jar to your CLASSPATH

- Connection URL:

```
jdbc:datadirect:opendedge://hostname:port[;property=value[;...]]
```

- Common properties: user, password, defaultSchema=pub,



# Query

- Standard SQL92 queries

```
select * from pub.customer;
```

- Progress provides extensions to the standard SQL92
  - Look for PRO\* in the documentation
  - Example: PRO\_ELEMENT to extract array entries

# Query

- Data is in the “pub” schema
  - You can add data to other schemas, but won't be visible to 4GL
- Surround schema and field names by double-quotes
  - Required if there are dashes in table/field names
- Surround string values in single quotes

# Client statement cache

```

2023/11/13 ProTop RT 326-qa2 16:20:12
mb117sports /data/mb117/db/mb117/sports protoptest
>#UAp Ap
Login Name: mb Login Time: Mon Nov 13 16:19:13 2023 -Bp Bufs: 0 BI Reads: 0 Logical Rd: 41
Usr#: 118 Device/IP: 127.0.0.1 -Bp Used: 0 BI Writes: 0 Logical Wr: 0
Connect Id: 119 Full Name: Server: 3 AI Reads: 0 Disk Reads: 1
PID: 11535 Phone: Serv PID: 0 AI Writes: 0 Hit%: 99
TID: 0 E-Mail: Serv TID: 0 Num TRX: 0
Session Info: SQLC REMC RQ * TRX Curr Locks: 0
TRX Info: BEGIN FWD 5958302 Duration: Waiting On: -- 0 Lock HWM: 2

Session Table Activity
Tbl# Area# Table Name RM Chain #Records Frag% Scat Churn AvgRow Create Read Update Delete OS Read
2 8 Customer 1 83 0.00% 1 0.26 149 0 21 0 0 0 ?
-2 6 _Field 1 2008 12.75% 3 0.00 301 0 5 0 0 0 ?
-3 6 _Index 2 203 0.49% 2 0.01 180 0 2 0 0 0 ?
-1 6 _File 4 186 16.13% 4 0.01 366 0 2 0 0 0 ?
-4 6 _Index-Field 2 385 0.00% 2 0.00 154 0 1 0 0 0 ?
-361 6 _Constraint-Keys 0 0.00% 0.00 0 0 0 0 0 0 ?
-360 6 _Constraint 0 0.00% 0.00 0 0 0 0 0 0 ?

Session Index Activity
Idx# Area# Index Name Blocks Util Lvl# Idx Root Note Create Read Split Delete BlkDl
2 6 _Field._File/Field 15 50.10% 2 256 PU 0 6 0 0 0
6 6 _Index-Field._Index/Number 1 95.90% 1 480 PU 0 1 0 0 0
5 6 _Index._File/Index 4 25.70% 2 384 PU 0 1 0 0 0
1033 6 _Index._Index-Number 1 45.40% 1 448 0 1 0 0 0
1032 6 _File._File-Number 1 41.50% 1 224 0 1 0 0 0
1 6 _File._File-Name 1 68.70% 1 128 P 0 0 0 0 0
1093 6 _Word-rule._Wr-Number 1 0.10% 1 1184 PU 0 0 0 0 0

Session 4GL Call Stack
Depth Line# Program Name
1 1 select * from pub.customer

User's Other Sessions
USR# PID Flags Server Device/IP Address Login Time Line# Program Name
0 10080 LXB 0 Nov 13 00:00:31 0
1 18700 @XB 0 Nov 13 00:05:54 0
2 18733 @XB 0 Nov 13 00:05:54 0
3 11535 @XB 0 Nov 13 16:19:12 0
21 10082 OXB 0 Nov 13 00:00:31 0
22 10085 HXB 0 Nov 13 00:00:32 0
    
```

Logitech Presentation

? = help q = quit p = pause <space> = refresh Ar = reports

## Correct: SQL width

- Memory allocation per schema field
  - Actual field could contain more characters
- Use dbtool occasionally to update SQL width
- Use Autonomous Schema Update and SQL Truncate Too Large
- CAREFUL with SQL Truncate Too Large: ON vs OFF vs OUTPUT
  - ON also affects WHERE clause
- ASU happens AFTER the query completes

## Correct: update statistics

- SQL uses a cost-based optimizer vs rules-based for 4GL queries
- Requires statistics on the data and keys
- Ctrl-u in ProTop

# Update statistics

```
2023/11/13 ProTop RT 326-ga2 16:41:32
mb117/sports /data/mb117/db/mb117/sports prototest

*#UAp Ap Ag
Login Name: mb
Usr#: 118
Connect Id: 119
PID: 11535
TID: 0

Session Info: SQLC REMC
TRX Info: BEGIN FWD

Tbl# Area# Table Name
-361 6 _Constraint
-360 6 _Constraint
-351 6 _Partition-
-350 6 _Partition-
-340 6 _Tenant
-208 6 _KeyEvent
-207 6 _sec-authen

Idx# Area# Index Name
1093 6 _Word-rule.
1092 6 _Collation.
1091 6 _Collation.
1090 6 _Codepage.
1089 6 _Codepage.
1088 6 _Db-Option.
1087 6 _Field._Fie

Depth Line# Program Nam
1 1 select * fr

USR# PID Flags Ser
0 10080 LXB
1 18700 @XB
2 18733 @XB
3 11535 @XB
21 10082 OXB
22 10085 HXB

2023/11/13 ProTop Help - Command Keys
/data/mb117/db/mb117/sports
Command Keys are Case-Sensitive

d = Performance Dashboard
t = Table Activity
i = Index Activity
l = LOB Activity
u = User IO Activity
x = Active Transactions
L = Login Brokers
a = Storage Areas
Ab = Buffer Pools

U = User Information Viewer
H = Health Check
Al = Progress "showcfg" info

0 = Color Picker
! = Generate DBAnalys Output
R = DB Parameters Report

2 = Pro2 Queues

Ap = programmer mode
Ad = dump & load scripts
Af = FAQ about oddball stuff

; = Set Refresh Interval

% = Switch between Raw
p = Pause to allow manual screen escape
( = Set Top X Row Limit

<space> = Refresh Sample (or un-pause)
Z = Repaint Screen
h, ? = Help
q = Quit

Forum: https://community.wss.com/

c = Configuration Viewer
w = Latches and Resources
k = Checkpoints
b = Blocked Sessions
r = OE Replication Agents
f = File IO
s = Server Activity
A = "Classic" App Servers
B = BigB Guesstimator

# = Set Usr#
* = Client Statement Cache
3 = User IO client-type filter

6 = Set Table Name
7 = Set Index Name
S = Client/Server Parameters

j = PASOE Health Scanner

^u = SQL update stats script

o = OS Info (if avail)
Q = SQL activity
D = Disk Free Space
/ = Sequences
N = Network Traffic
W = Who is Connected?
m = Multi-Tenant Info
e = Application Specific
Aa = After-Imaging Info

P = Set Process Id
_ = Clear Client Statement Cache

8 = Monitor Users of a Table
9 = Monitor Users of an Index
T = Show Table and Index Ranges

C = CDC Processing Queue

At = show session temp-tables
Y = show session user*stat
v = run profiler on this session

Logical Rd: 0
Logical Wr: 0
Disk Reads: 0
Hit%: 0
Num TRX: 0
Curr Locks: 0
Lock HWM: 2

Delete OS Read
0 0 ?
0 0 ?
0 0 ?
0 0 ?
0 0 ?
0 0 ?
0 0 ?

Delete BlkdI
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0

Online Help: https://wss.com/protop/help

Logitech Presentation
```



# Update statistics

```
Update SQL Statistics

Output is in:

/data/mb117/pt/tmp/mb117sports.updstats.sql

To update statistics run:

proenv> sqlexp -user userName -password password -db dbName -S servicePort
          -infile dbname.updstats.sql -outfile updSQLstats.log

<OK>
```

```
$ cat /data/mb117/pt/tmp/mb117sports.updstats.sql
UPDATE TABLE STATISTICS AND INDEX STATISTICS AND ALL COLUMN STATISTICS FOR PUB."Customer";
commit work;
UPDATE TABLE STATISTICS AND INDEX STATISTICS AND ALL COLUMN STATISTICS FOR PUB."Invoice";
commit work;
UPDATE TABLE STATISTICS AND INDEX STATISTICS AND ALL COLUMN STATISTICS FOR PUB."Item";
commit work;
UPDATE TABLE STATISTICS AND INDEX STATISTICS AND ALL COLUMN STATISTICS FOR PUB."Local-Defau
```

# Update statistics

- Run when the texture of the data changes:
  - Mass load or mass purge
- Can run quarterly
- Run for tables that are queried



## Correct: isolation level

- READ UNCOMMITTED = dirty read
  - But does not lock records
- READ COMMITTED locks records until query completes
  - I have seen this cause problems on many occasions !!

## Correct: -B pollution

- Large SQL queries will pollute buffer cache
- Eject working set and replace with one-time historical data
- Use private buffers, even in SQL

```
UPDATE pub."_MyConnection" SET "_MyConn-NumSeqBuffers" = 6.
```

# Gotchas: 4GL triggers

- 4GL triggers WILL NOT RUN
- These are 4GL code that run on the 4GL client side, not on the server side
- Would have to program SQL triggers and stored procedures

# Gotchas: Dump and load

- Do not forget to dump and load all the SQL properties!
  - GRANTS
  - VIEWS
  - PROCEDURES
  - TRIGGERS

# Optimize: SQL plan

- You can see which indexes were selected:

```
>select * from pub."_sql_qplan";
```

```
SQLExplorer>select * from pub."_sql_qplan";
```

Pnumber	Ptype	Dtype	Description
2	1	0	SELECT COMMAND.
2	1	0	PROJECT [54] (
2	1	0	PROJECT [52] (
2	1	0	PUB.CUSTOMER. [0] (
2	1	0	TABLE SCAN
2	1	0	)
2	1	0	, PUB.CUSTOMER.Cust-Num
2	1	0	, PUB.CUSTOMER.Name
2	1	0	, PUB.CUSTOMER.Address
2	1	0	, PUB.CUSTOMER.Address2
2	1	0	, PUB.CUSTOMER.City
2	1	0	, PUB.CUSTOMER.State
2	1	0	, PUB.CUSTOMER.Country
2	1	0	, PUB.CUSTOMER.Phone
2	1	0	, PUB.CUSTOMER.Contact
2	1	0	, PUB.CUSTOMER.Sales-Rep

# Optimize: SQL plan

```
select name from pub.customer where name like 'A%';
```

```
SQLExplorer>select * from pub."_sql_qplan";
 _Pnumber _Ptype _Dtype _Description
-----
      7      1      0 SELECT COMMAND.
      7      1      0 PROJECT [14] (
      7      1      0 |   PROJECT [12] (
      7      1      0 | |   PUB.CUSTOMER. [1](
      7      1      0 | | |   INDEX SCAN OF (
      7      1      0 | | | |   Name,
      7      1      0 | | | | |   (PUB.CUSTOMER.Name) between (A,A)
      7      1      0 | | | | |
      7      1      0 | | | | )
      7      1      0 | | | | , PUB.CUSTOMER.Name
      7      1      0 | | | | )
      7      1      0 | | | | , PEXPR1
      7      1      0 | | | | )
```

# Optimize: logging

```
set pro_server log on with (statement);
```

- Creates a log file SQL\_server\_#\_YYYYMM...
  - In working directory (where broker was started)

# Optimize: logging

```
$ cat /home/mb/SQL_server_3_20231113_170801_A.log
SQL LOG Section Started at 20231113_170801

SQL Environment Variable Settings:
  CLASSPATH=UNDEFINED

SQL LOG CONFIGURATION
  STATEMENT
  LOGGING LEVEL 1

SQL LOG FILE MAXIMUM SIZE: 50000000 Bytes

SQL SERVER ID: 3

20231113_170801 140351974057728:
Returning from sql_fn() with code: 0
20231113_170812 140351974057728:
Freeing Cursor for SQL Statement id : 140351974057728169989528111535
20231113_170812 140351974057728:
Returning from sql_fn() with code: 0
20231113_170812 140351974057728:
Setting Cursor for SQL Statement :
20231113_170812 140351974057728:
Returning from sql_fn() with code: 0
20231113_170812 140351974057728:
Preparing SQL Statement id : 140351974057728169989529211535 : select * from pub.customer where name like 'A%'
20231113 170812 140351974057728:
```



Questions?



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## Monitor OpenEdge. Anticipate Problems. Avert Disasters.

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535

Customer Sites

1.5

Petabytes of data

4,500

Databases

325,000

Connected users