

RPGLE as a web service

Using SQL to create basic services

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Agenda

- Ways for RPG/ILE to return data
- Capturing that data with SQL
- Turning that into a web service by using PHP, Node.js, Python, etc



Returning data from RPG



Procedure output parameters

Untitled* - Run SQL Scripts - seiden.iinthecloud.com(Seiden)

```
File Edit Search View Connection Run Explain Monitor Tools Help
```

1 call barry.sums1(5, 5, null)

[20/03/2022, 11:49:38] Run Selected...

call barry.sums1(5, 5, null)
✓ Return Code = 0
Output Parameter #3 (RESULT) = 10
✓ Statement ran successfully (84 ms)

Connected to relational database Seiden on seiden.iinthecloud.co Lines: 1 Ln: 1 Col: 29

SUMP1.RPGLE

BARRY > SLIDES > SUMP1.RPGLE

```
1 000000 **FREE
2 000000
3 220320 Dcl-Pi SUMP1;
4 000000 numa int(10);
5 000000 numb int(10);
6 000000 result int(10);
7 000000 End-Pi;
8 000000
9 000000 result = numa + numb;
10 000000
11 000000 Return;
```

SUMS1.SQL

BARRY > SLIDES > SUMS1.SQL

```
1 220320 create or replace procedure barry.sums1 (
2 220320   IN numa INT,
3 220320   IN numb INT,
4 220320   OUT result INT
5 220320 )
6 000000 LANGUAGE RPGLE
7 220320 EXTERNAL NAME BARRY.SUMP1 GENERAL;
```

Function return value

The screenshot shows the Red Hat Developer Studio interface with several windows open:

- SUMP1.RPGLE**: Contains RPGLE code for a procedure named `sump2` that adds two integers.
- SUMP2.RPGLE**: Contains the definition of the `sump2` function.
- values (barry.sum2(5, 5)) Untitled-1**: A temporary file containing the command `values (barry.sum2(5, 5))`.
- SUMS2.SQL**: Contains SQL code to create a function `barry.sum2` that calls the RPGLE function.
- Database Result**: A table showing the output of the command in the temporary file, with rows for 00001 and 10.

Toolbars and status bars at the bottom provide various development tools and settings.

```
values (barry.sum2(5, 5)) Untitled-1
1 values (barry.sum2(5, 5))

BARRY > SLIDES > SUMP2.RPGLE > ...
1 220320 **FREE
2 220320
3 220320 ctl-opt nomain;
4 220320
5 220320 dcl-proc sump2 export;
6 220320   dcl-pi *n int(10);
7 220320     numa int(10) const;
8 220320     numb int(10) const;
9 220320   end-pi;
10 220320
11 220320   return numa + numb;
12 220320 end-proc;

SUMS2.SQL
BARRY > SLIDES > SUMS2.SQL
1 220320 create or replace function barry.sum2 (
2 220320   numa INT,
3 220320   numb INT
4 220320 )
5 220320 RETURNS INT
6 220320 LANGUAGE RPGLE
7 220320 EXTERNAL NAME BARRY.SUMP2(SUMP2)
8 220320 PARAMETER STYLE GENERAL;
```

	00001
	10

Program result set

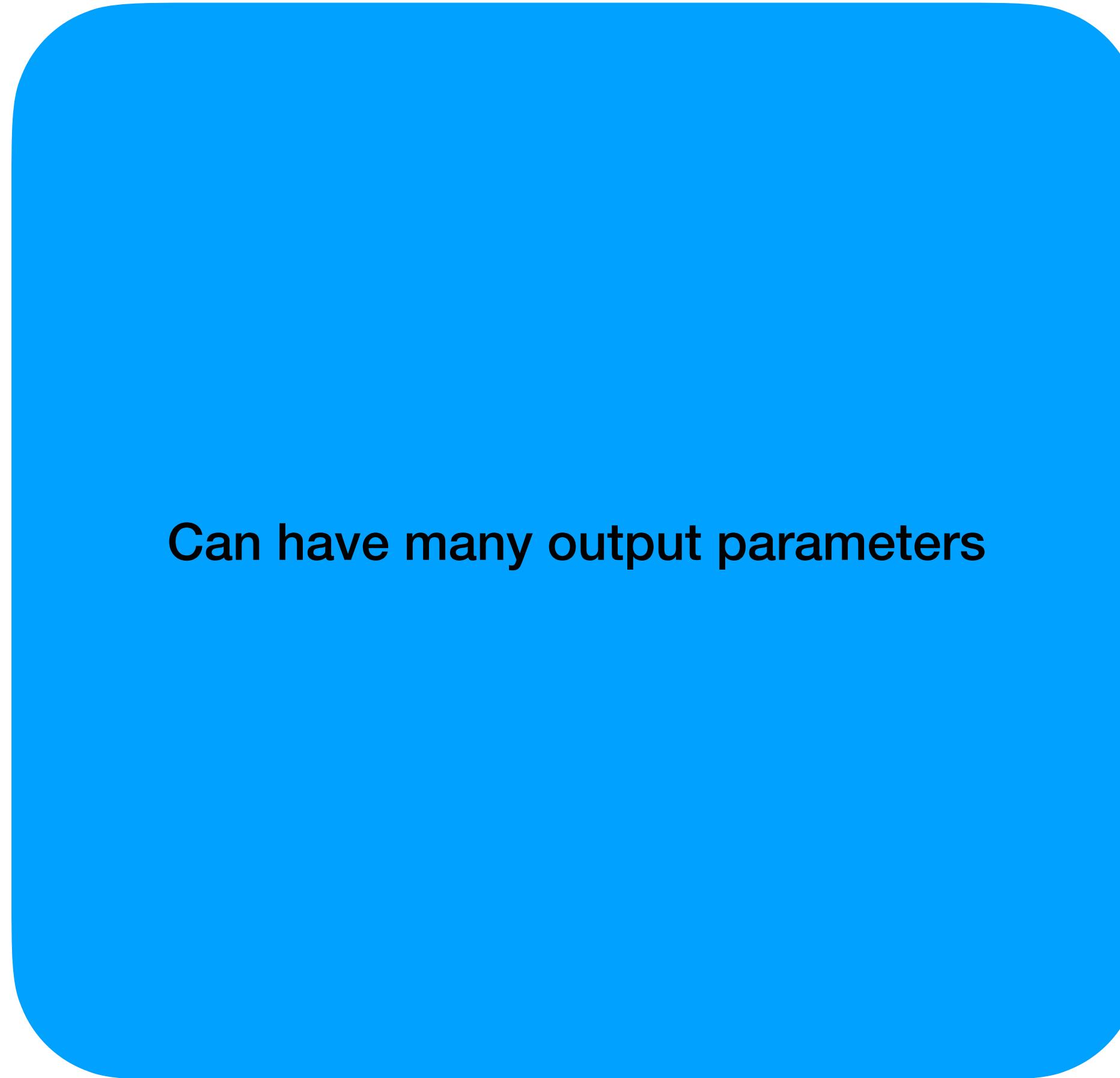
The screenshot shows the Red Hat Developer Studio interface with the following components:

- Editor View (Top Left):** Displays the RPGLE source code for the program `SUMP3.SQLRPGLE`. The code defines a procedure `sump3` that adds two integers (`numa` and `numb`) and returns the result. It also demonstrates the use of an array result set.
- Terminal View (Bottom Left):** Shows the command `call barry.sump3(5, 5);` being run in an Untitled-1 terminal window.
- Database Result View (Bottom Right):** Shows the output of the command, with the result value `10` displayed under the heading `RESULT`.
- File Explorer (Left Sidebar):** Shows the file structure: `BARRY > SLIDES > SUMP3.SQLRPGLE > ...`
- Toolbars and Status Bar:** Includes standard developer tools like Settings, Actions, Output, Terminals, and Typewriter ON. The status bar at the bottom indicates Spaces: 2, UTF-8, LF, RPGLE, and various icons for file operations.

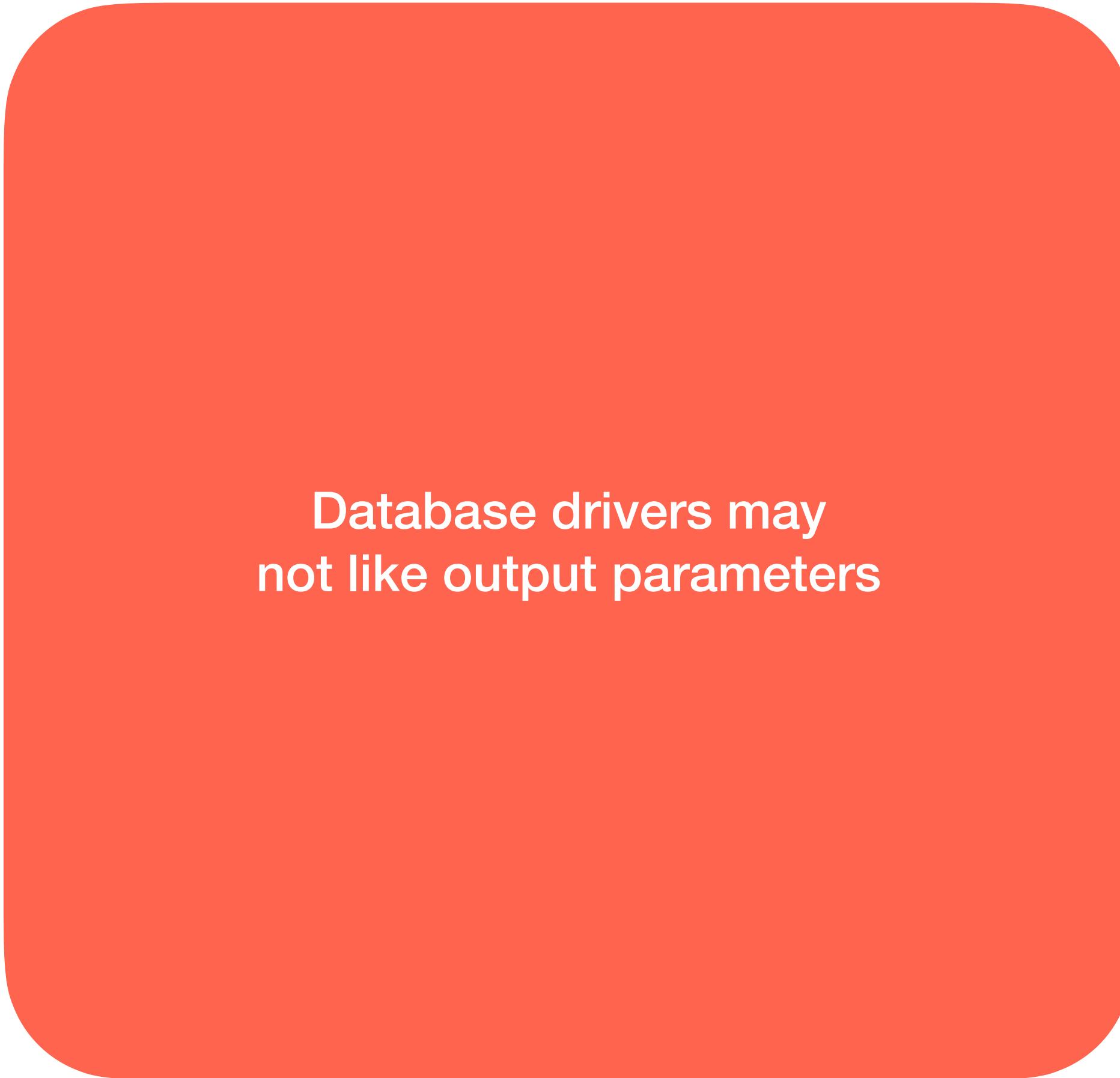
Pros and cons

Procedure with output parameter

Pros & cons



Can have many output parameters



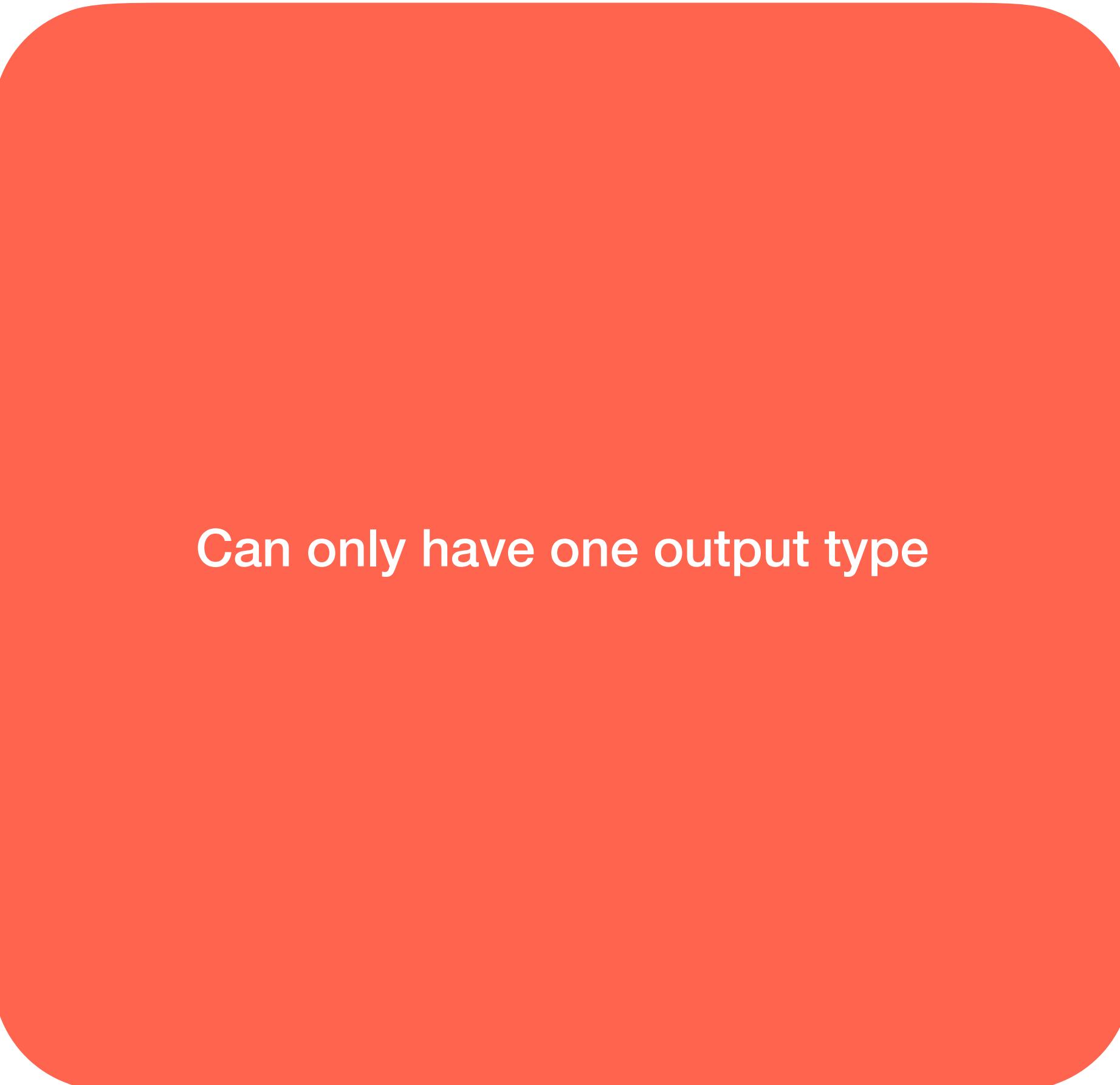
Database drivers may
not like output parameters

Function return value

Pros & cons



Great for embedding into
existing SQL statements



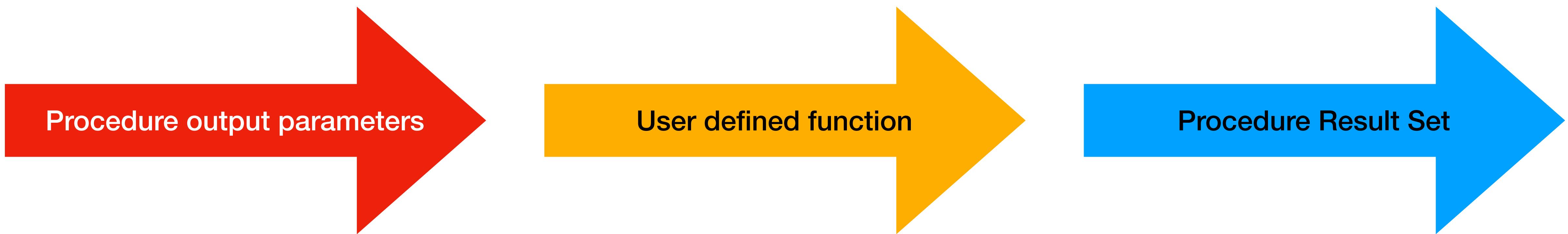
Can only have one output type

Procedure result sets

Pros & cons

Can return many rows

Might choose to write in
RPG instead of SQL/PL



Examples

Salary sum RPGLE function

The screenshot shows a terminal window with several tabs and panels. On the left, there's a vertical toolbar with icons for file operations, search, and other functions. The main area has three tabs:

- SALSUM.RPGLE**: Contains RPGLE code for a procedure named GetSalarySum. The code reads from a file named 'SAMPLE/EMPLOYEE' and sums up the salaries of all employees.
- SALSUMF.SQL**: Contains SQL code to create a function named barry.GetSalarySum that calls the RPGLE procedure.
- values (barry.GetSalarySum()) Untitled-1**: A panel showing the output of the SQL function, which is 1152525.

At the bottom, there are standard terminal navigation and status bars.

```
1 **free
2
3 ctl-opt nomain alwnull(*usrctl);
4
5 Dcl-Proc GetSalarySum Export;
6   dcl-pi *N packed(17:2) end-pi;
7   dcl-f employee extfile('SAMPLE/EMPLOYEE') rename(employee:emp);
8
9   Dcl-Ds empRow likerec(emp);
10
11   Dcl-s total packed(17:2);
12
13   read EMPLOYEE empRow;
14   Dow (NOT %EOF(EMPLOYEE));
15     total += empRow.SALARY;
16     read EMPLOYEE empRow;
17   Enddo;
18
19   return total;
20 End-Proc;
```

```
1 create or replace function barry.GetSalarySum ()
2 RETURNS DECIMAL(17, 2)
3 LANGUAGE RPGLE
4 EXTERNAL NAME BARRY.SALSUM(GETSALARYSUM)
5 PARAMETER STYLE GENERAL;
```

Database Result

values (barry.GetSalarySum())
1152525

Salary sum SQL statement

The screenshot shows a terminal window with the following interface elements:

- File Menu:** values (barry.GetSalarySum()); Untitled-1
- Search:** magnifying glass icon
- Share:** network icon
- Run:** play triangle icon
- Database:** lightning bolt icon
- Help:** three dots icon
- User:** person icon
- Gears:** settings gear icon

Code Area:

```
values (barry.GetSalarySum()); Untitled-1
1 values (barry.GetSalarySum());
2
3 select sum(salary) from sample.employee;
```

Database Result:

00001
1152525

Bottom Bar:

- Terminal status: 0 0 2 < >
- Settings: sg
- Actions: </>
- Output: Output
- Terminals: Terminals
- Type writer mode: Typewriter ON
- Mode: LF
- Language: SQL
- User: 🧑
- Help: 📖
- Log: 📈

Salary sum SQL function

The screenshot shows a terminal window with the following interface elements:

- File Explorer:** On the left, it shows a file named "SALSUMF2.SQL" with a count of 1. The path is BARRY > SLIDES > SALSUMF2.SQL.
- Code Editor:** The main area contains the following SQL code:

```
1 create or replace function barry.GetSalarySum2 ()  
2 RETURNS DECIMAL(17, 2)  
3 BEGIN  
4     DECLARE result DECIMAL(17, 2);  
5  
6     SELECT SUM(salary) INTO result FROM sample.employee;  
7  
8     RETURN result;  
9 END;
```
- Terminal:** Below the code editor, there is a terminal window with the following content:

```
values (barry.GetSalarySum()); Untitled-1 ●  
1 values (barry.GetSalarySum());  
2  
3 select sum(salary) from sample.employee;  
4  
5 values (barry.GetSalarySum2());
```
- Database Result:** To the right of the terminal, there is a "Database Result" pane showing the output of the commands:

Result
00001
1152525
- Bottom Bar:** The bottom bar includes icons for file operations, a settings gear, actions, output, terminals, and various system settings like spaces, encoding, and keyboard layout.

Employees

Display file

The screenshot shows an IBM i 5250 terminal window with two panes. The left pane displays a SQL RPGLE program named DEPTS.SQLRPGLE. The right pane shows the output of the program, which is a list of departments.

Left Pane (Program Source):

```
DEPTS.SQLRPGLE
...
85      Dcl-Proc LoadSubfile;
86      Dcl-S lCount Int(5);
87      Dcl-S Action Char(1);
88      Dcl-S LongAct Char(3);
89
90      ClearSubfile();
91
92      EXEC SQL DECLARE deptCur CURSOR FOR
93          SELECT DEPTNO, DEPTNAME
94          FROM DEPARTMENT;
95
96      EXEC SQL OPEN deptCur;
97
98      if (sqlstate = '00000');
99
100     dou (sqlstate <> '00000');
101        EXEC SQL
102            FETCH NEXT FROM deptCur
103            INTO :Department.DEPTNO, :Department.DEPTNA
104
105        if (sqlstate = '00000');
106            XID = Department.DEPTNO;
107            XNAME = Department.DEPTNAME;
108
109            rrr += 1;
110            Write SFLDTA;
111
112        endif;
113    enddo;
114
115    endif;
116
117    EXEC SQL CLOSE deptCur;
118
119    If (rrr > 0);
120        SflDsp = *On;
121        SFLRRN = 1;
122    Endif;
```

Right Pane (Output):

Departments		
Opt	ID	Name
	A00	SPIFFY COMPUTER SERVICE DIV.
	B01	PLANNING
	C01	INFORMATION CENTER
	D01	DEVELOPMENT CENTER
	D11	MANUFACTURING SYSTEMS
	D21	ADMINISTRATION SYSTEMS
	E01	SUPPORT SERVICES
	E11	OPERATIONS
	E21	SOFTWARE SUPPORT
	F22	BRANCH OFFICE F2
	G22	BRANCH OFFICE G2
	H22	BRANCH OFFICE H2
	I22	BRANCH OFFICE I2
	J22	BRANCH OFFICE J2

MW
008/008

Employees

Display file conversion (1)

10— /copy qrpgleref,constants	10+ Dcl-Ds resultSet Qualified Dim(50);
11—	11+ id like(Department.DEPTNO);
12— //-----	12+ name like(Department.DEPTNAME);
13—	13+ End-Ds;
14— Fdeps CF E WorkStn Sfile(SFLDta:Rrn)	
15— F	
16— F	
17—	
18— Dcl-S Exit Ind Inz(*Off);	
19	

14

55— Exit = *Off;	25 LoadSubfile();
56 LoadSubfile();	26
57	
58— Dow (Not Exit);	27+ EXEC SQL SET RESULT SETS ARRAY :resultSet for :Rrn rows;
59— Write FOOTER_FMT;	
60— Exfmt SFLCTL;	
61—	
62— Select;	
63— When (Funkey = F03);	
64— Exit = *On;	
65— When (Funkey = ENTER);	
66— HandleInputs();	
67— Ends;	
68— Enddo;	

Employees

Display file conversion (2)

Employees

Result set

The screenshot shows a terminal window with three tabs. The active tab displays the result of a SQL query: 'call barry.depts();'. The results are presented in a table with columns 'ID' and 'NAME'.

ID	NAME
A00	SPIFFY COMPUTER SERVICE DIV.
B01	PLANNING
C01	INFORMATION CENTER
D01	DEVELOPMENT CENTER
D11	MANUFACTURING SYSTEMS
D21	ADMINISTRATION SYSTEMS
E01	SUPPORT SERVICES
E11	OPERATIONS
E21	SOFTWARE SUPPORT
F22	BRANCH OFFICE F2
G22	BRANCH OFFICE G2
H22	BRANCH OFFICE H2

Below the table, the terminal interface includes standard navigation and status indicators.

Employees

Result set
comparison

The screenshot shows an IBM i 5250 terminal window with two tabs open: "Database Result" and "call barry.depts(); Untitled-1".

Database Result:

ID	NAME
A00	SPIFFY COMPUTER SERVICE DIV.
B01	PLANNING
C01	INFORMATION CENTER
D01	DEVELOPMENT CENTER
D11	MANUFACTURING SYSTEMS
D21	ADMINISTRATION SYSTEMS
E01	SUPPORT SERVICES
E11	OPERATIONS
E21	SOFTWARE SUPPORT
F22	BRANCH OFFICE F2
G22	BRANCH OFFICE G2
H22	BRANCH OFFICE H2
I22	BRANCH OFFICE I2
J22	BRANCH OFFICE J2

call barry.depts(); Untitled-1:

Opt	ID	Name
	A00	SPIFFY COMPUTER SERVICE DIV.
	B01	PLANNING
	C01	INFORMATION CENTER
	D01	DEVELOPMENT CENTER
	D11	MANUFACTURING SYSTEMS
	D21	ADMINISTRATION SYSTEMS
	E01	SUPPORT SERVICES
	E11	OPERATIONS
	E21	SOFTWARE SUPPORT
	F22	BRANCH OFFICE F2
	G22	BRANCH OFFICE G2
	H22	BRANCH OFFICE H2
	I22	BRANCH OFFICE I2
	J22	BRANCH OFFICE J2

Call Barries:

	5250	MW	008/007	008/007

Employees

Result set
from SQL procedure

The screenshot shows a terminal window with several tabs and icons on the left. The main area displays two SQL scripts and their execution results.

Script 1 (DEPTSP.SQL):

```
1 CREATE OR REPLACE PROCEDURE BARRY.GetDepartments LANGUAGE SQL
2   DYNAMIC RESULT SETS 1
3   BEGIN
4     DECLARE C1 CURSOR FOR
5       SELECT DEPTNO, DEPTNAME FROM SAMPLE.DEPARTMENT;
6     OPEN C1;
7     RETURN;
8   END;
```

Script 2 (Untitled-1):

```
1 call Barry.GetDepartments();
```

Execution Result:

DEPTNO	DEPTNAME
A00	SPIFFY COMPUTER SERVICE DIV.
B01	PLANNING
C01	INFORMATION CENTER
D01	DEVELOPMENT CENTER
D11	MANUFACTURING SYSTEMS
D21	ADMINISTRATION SYSTEMS
E01	SUPPORT SERVICES
E11	OPERATIONS
E21	SOFTWARE SUPPORT
F22	BRANCH OFFICE F2
G22	BRANCH OFFICE G2
H22	BRANCH OFFICE H2
I22	BRANCH OFFICE I2
J22	BRANCH OFFICE J2

Status Bar:

- Icons: file, search, connection, copy, paste, refresh, user, gear.
- Text: "Settings: sg" and "Actions".
- Text: "Ln 1, Col 29 Spaces: 2 UTF-8 LF SQL" and other terminal settings.

Message:

Info Action Run SQL for BARRY/DEPTSP was successful.

Using the Data

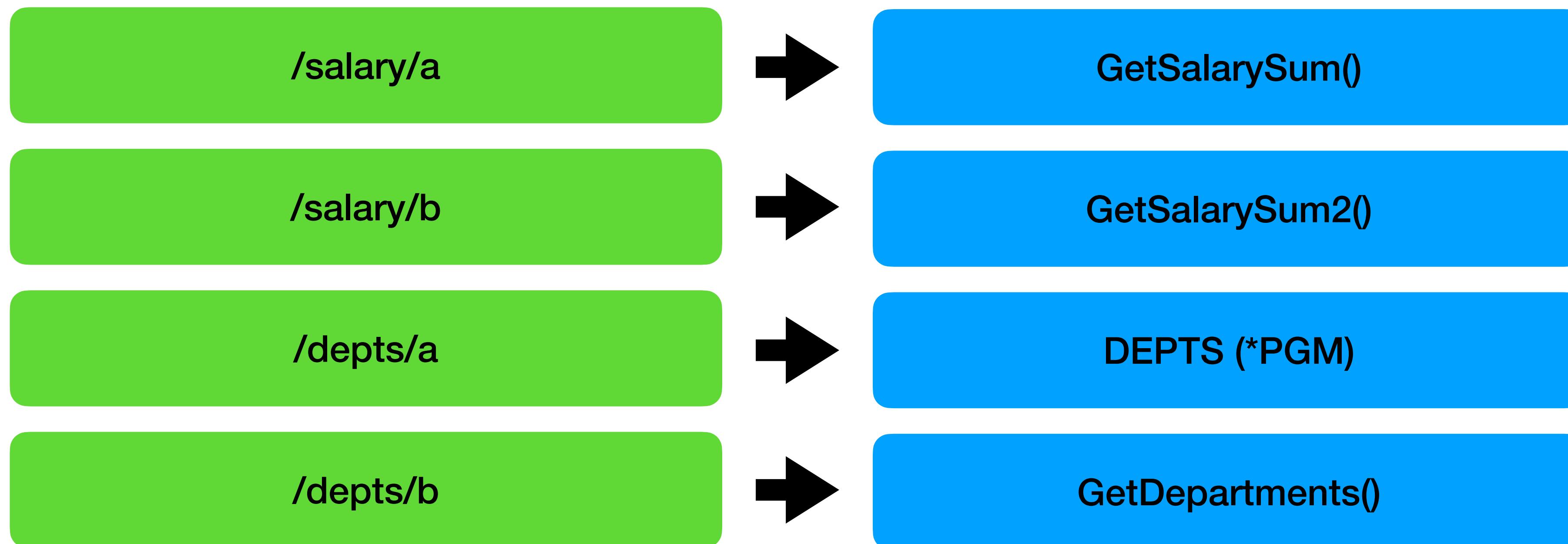


STMTS.SQL •

BARRY > SLIDES > STMTS.SQL

```
1 values (barry.GetSalarySum());
2
3 values (barry.GetSalarySum2());
4
5 call barry.depts();
6
7 call barry.GetDepartments();
```

Mapping the routes



Tech choice



Node.js

Modules used

Express

ODBC

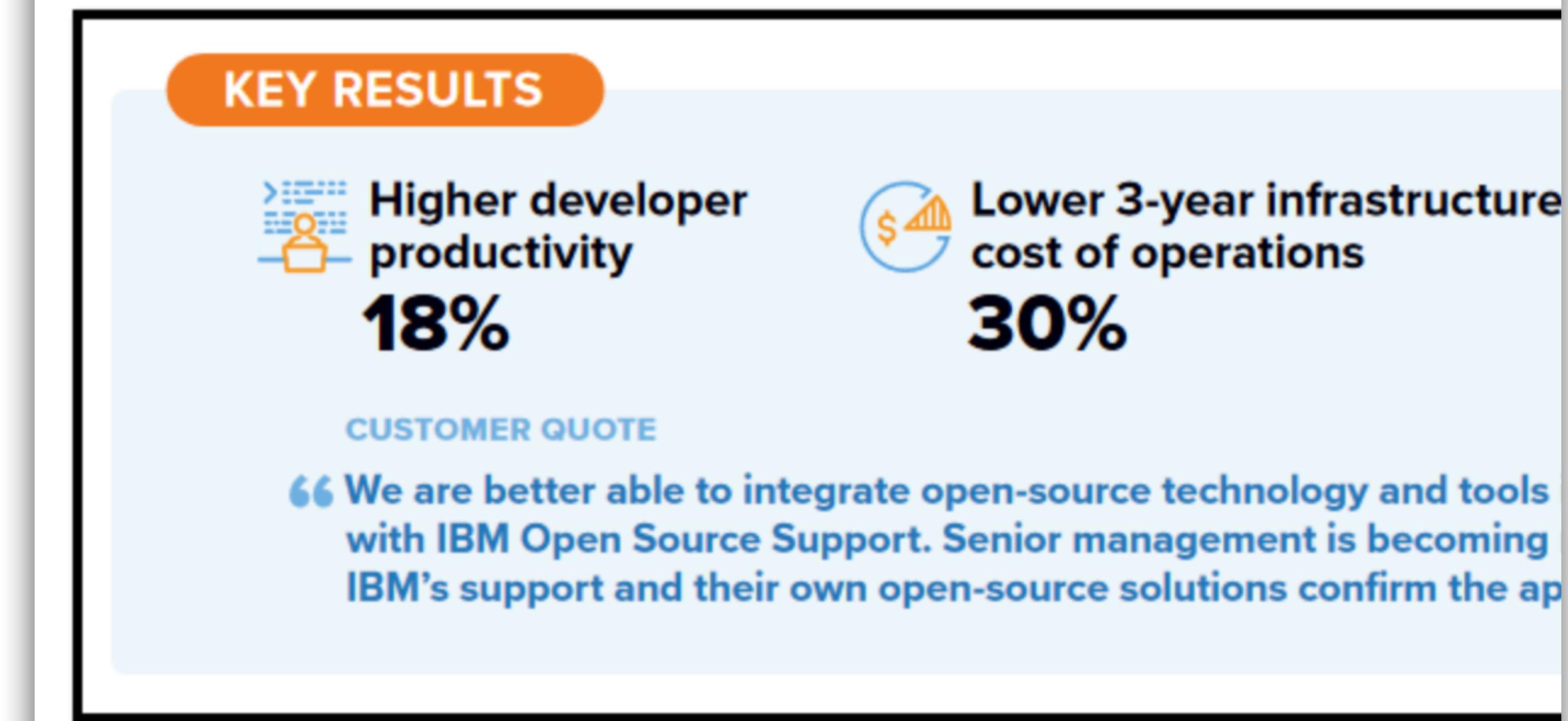
IBM TLS (Technology Lifecycle Services)

<http://ibm.biz/ibmi-oss-support>

IDC study on IBM's open source support

A January 2021 IDC study showed the business benefits of IBM's open source support.

- [One-page summary](#)
- [Executive Summary](#)
- [Full Whitepaper](#)



Obtaining Support from TSS

If you have purchased this TSS open source support and are opening a new Case through the TSS portal, you would select "Product manufacturer = Open Source", and then the "Product" would be the open source project you are supporting. An example of what that would look like for Apache Tomcat:

Demo

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