

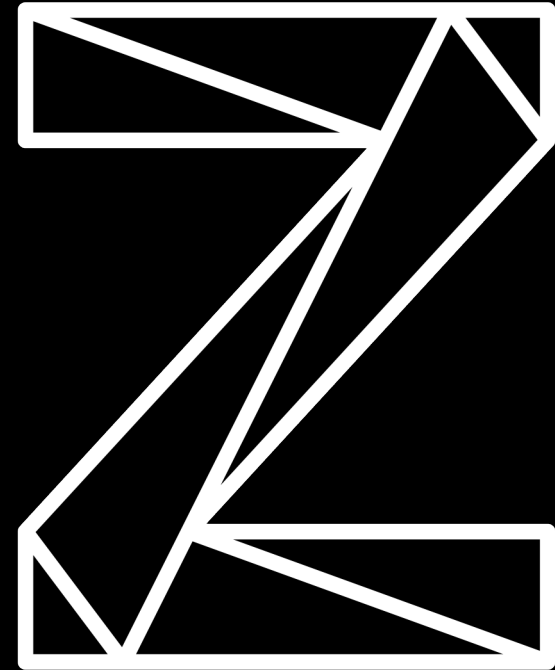
Db2 for z/OS Developer Extension

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Agenda

Objectives

VSCode overview

- IBM Db2 for z/OS Developer Extension
- Zowe Extension
- IBM Z Open Editor



Transform the Db2 for z/OS user experience and provides a consistent experience in a multicloud environment for application development

Transform user experience

Key objectives



Increase developer talent pool by reducing Z domain specific skills and tools required to work with Db2 for z/OS

Reduce cost to development, debug, and tune Db2 for z/OS applications

Increase velocity of feature development through improved productivity

Extension design is reusable, portable, easy to integrate with multiple IDE

Web-enabled, support client & clientless, cloud ready

Align with System Z cloud native development (IBM Z Open Development)

How will transforming Db2 for z/OS help Deb

Deb

New z/OS Developer

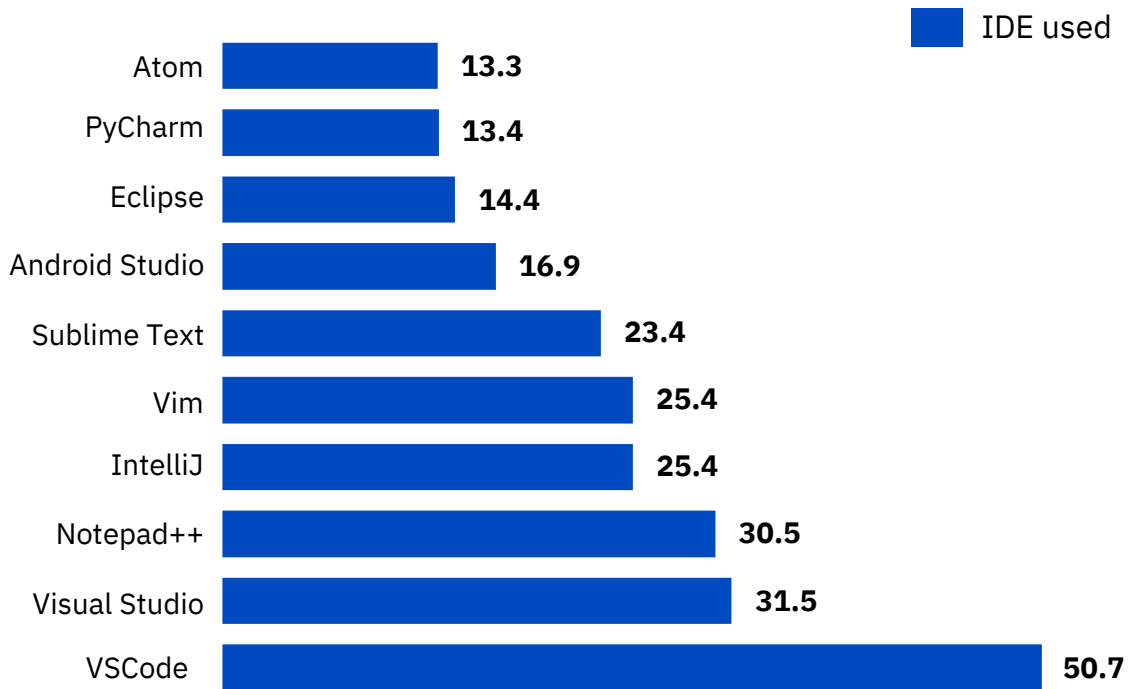


Use **Web IDE** with Db2 services to

- Code, debug, and tune Java, COBOL, PL1, Node applications that access Db2 for z/OS via SQL
- Code, analyze, run, tune SQL statements
- Code, debug, and tune Db2 for z/OS stored procedures
- Develop Db2 for z/OS Native Rest services

Why VSCode

Market Leading IDE



* 2019 stack overflow Developer Survey

Key Points

- Market leading
- Lightweight
- Broad language support
- Z support – Zowe, IBM Z Open Development extensions
- Cloud and desktop IDE
- Rich git integration
- Terminal support
- Extensive and active extension support
- Open
- Extensions for VSCode compatible with Eclipse Theia

Language Server Protocol (LSP) and Debug Adapter Protocol



Problem

- Used to require tight integration between IDE and individual language
- Expensive to support multiple IDEs
- $X \text{ Language} * Y \text{ IDE} = \text{too expensive to develop and maintain}$

Solution – LSP + DAP

- Create one language server and one debug adapter (backend)
- Multiple IDE support LSP and DAP
- We're ready when the “Willy Wonka IDE” becomes “The Next Big Thing”

Sample of LSP clients

- VSCode
- Eclipse Theia (IBM Wazi Red-Hat Code Ready Workspaces)
- Eclipse Rich Client (IDz)
- Vim
- Emacs ...

Cheaper to bring
Db2 for z/OS
development
capabilities to
more developers

Web based IDE

Basic features

Basic language features GA

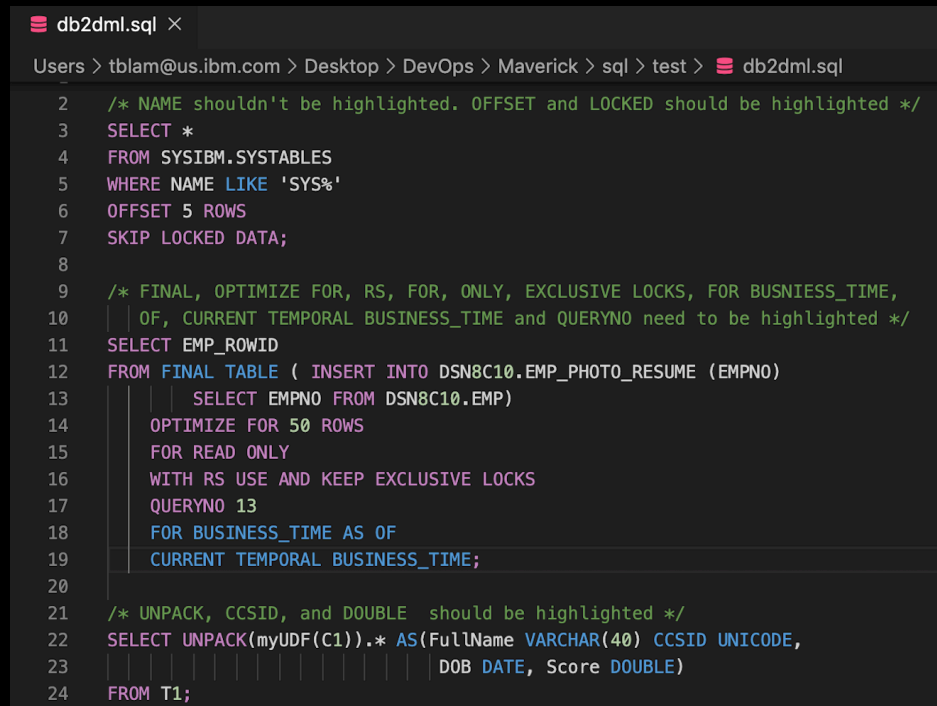
- SQL Syntax checking / highlighting
- Snippets

Pre-election (USA):

- Code completion
- Code folding
- Run SQL (BYOL)
- Run SQL with parameters (BYOL)

Further into the future

- Stored procedure debug and deploy
- Create Native Rest Services
- DCLGEN support

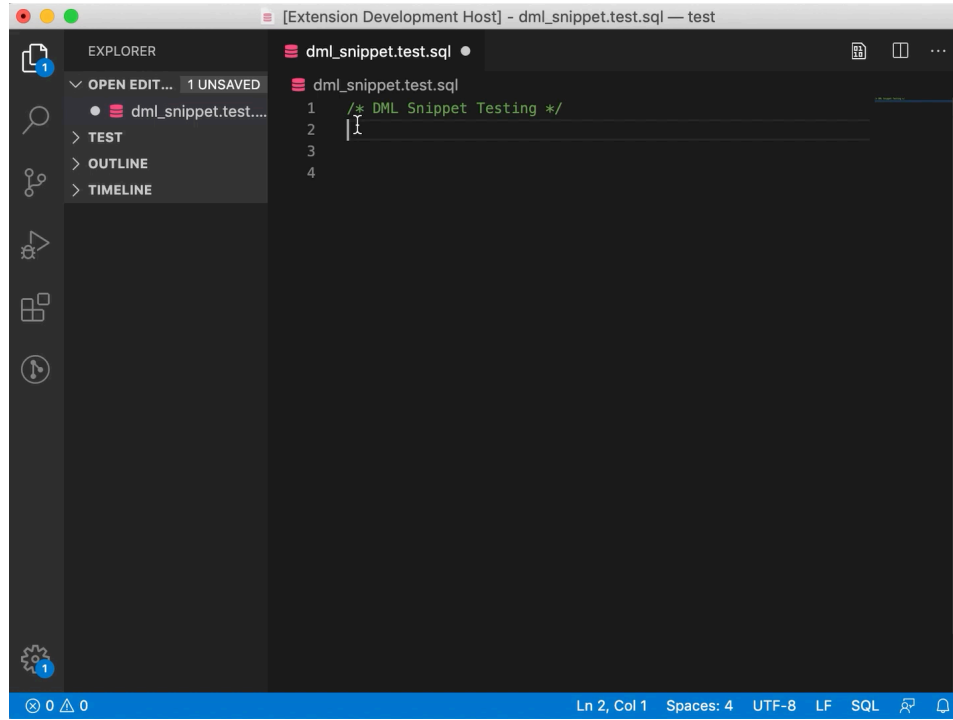


The screenshot displays a web-based SQL IDE interface. At the top, a breadcrumb navigation path reads: "Users > tblam@us.ibm.com > Desktop > DevOps > Maverick > sql > test > db2dml.sql". The main area is a code editor titled "db2dml.sql" containing SQL code with syntax highlighting. The code includes comments about highlighting rules, a SELECT statement with various clauses (FROM, WHERE, OFFSET, SKIP), and a complex query involving a subquery and multiple table joins. The code is as follows:

```
2  /* NAME shouldn't be highlighted. OFFSET and LOCKED should be highlighted */
3  SELECT *
4  FROM SYSIBM.SYSTABLES
5  WHERE NAME LIKE 'SYS%'
6  OFFSET 5 ROWS
7  SKIP LOCKED DATA;
8
9  /* FINAL, OPTIMIZE FOR, RS, FOR, ONLY, EXCLUSIVE LOCKS, FOR BUSINESS_TIME,
10 | OF, CURRENT TEMPORAL BUSINESS_TIME and QUERYNO need to be highlighted */
11 SELECT EMP_ROWID
12 FROM FINAL TABLE ( INSERT INTO DSN8C10.EMP_PHOTO_RESUME (EMPNO)
13 | SELECT EMPNO FROM DSN8C10.EMP)
14 | OPTIMIZE FOR 50 ROWS
15 | FOR READ ONLY
16 | WITH RS USE AND KEEP EXCLUSIVE LOCKS
17 | QUERYNO 13
18 | FOR BUSINESS_TIME AS OF
19 | CURRENT TEMPORAL BUSINESS_TIME;
20
21 /* UNPACK, CCSID, and DOUBLE should be highlighted */
22 SELECT UNPACK(myUDF(C1)).* AS(FullName VARCHAR(40) CCSID UNICODE,
23 | | | | | | | | | | DOB DATE, Score DOUBLE)
24 FROM T1;
```

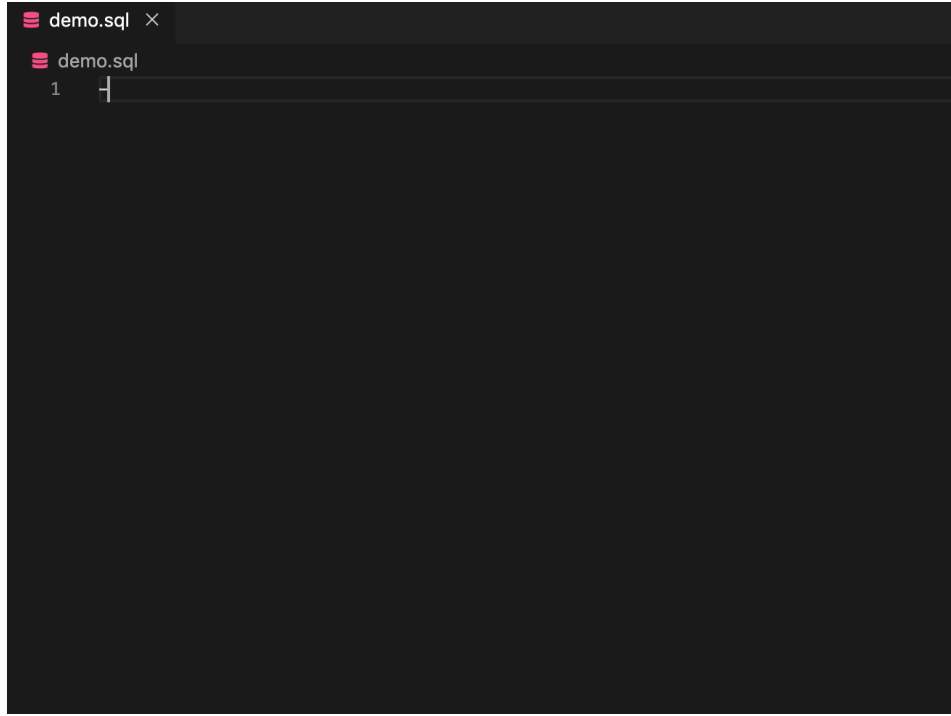
Web based IDE

DML snippets demo



Web based IDE

DDL snippets demo



Web based IDE

Stored procedure debug demo

Stored procedure debugging

- Set break points
- Step through code
- Monitor variables

The screenshot displays a web-based IDE interface for debugging a stored procedure. The main editor shows the following SQL code:

```
CREATE PROCEDURE RETURNDEPTSALARY
(IN DEPTNUMBER CHAR(3),
OUT DEPTSALARY DECIMAL(15,2),
OUT DEPTBONUSCNT INT)
LANGUAGE SQL
READS SQL DATA
P1: BEGIN
  DECLARE EMPLOYEE_SALARY DECIMAL(9,2);
  DECLARE EMPLOYEE_BONUS DECIMAL(9,2);
  DECLARE TOTAL_SALARY DECIMAL(15,2) DEFAULT 0;
  DECLARE BONUS_CNT INT DEFAULT 0;
  DECLARE END_TABLE INT DEFAULT 0;
  DECLARE C1 CURSOR FOR
    SELECT SALARY, BONUS FROM CORPDATA.EMPLOYEE
    WHERE WORKDEPT = DEPTNUMBER;
  DECLARE CONTINUE HANDLER FOR NOT FOUND
    SET END_TABLE = 1;
  DECLARE EXIT HANDLER FOR SQLEXCEPTION
    SET DEPTSALARY = NULL;
  OPEN C1;
  FETCH C1 INTO EMPLOYEE_SALARY, EMPLOYEE_BONUS;
  WHILE END_TABLE = 0 DO
    SET TOTAL_SALARY = TOTAL_SALARY + EMPLOYEE_SALARY + EMPLOYEE_BONUS;
    IF EMPLOYEE_BONUS > 0 THEN
      SET BONUS_CNT = BONUS_CNT + 1;
    END IF;
    FETCH C1 INTO EMPLOYEE_SALARY, EMPLOYEE_BONUS;
  END WHILE;
  CLOSE C1;
  SET DEPTSALARY = TOTAL_SALARY;
  SET DEPTBONUSCNT = BONUS_CNT;
END P1;
```

The left sidebar contains three panels:

- VARIABLES:** Shows local variables: DEPTBONUSCNT: null, DEPTSALARY: null, and DEPTNUMBER: A00.
- CALL STACK:** Shows the execution flow: CREATE(0) at line 1, PROCEDURE(1) at line 1, and RETURNDEPTSALARY(2) at line 1.
- BREAKPOINTS:** Shows three breakpoints set at lines 1, 25, and 30 of sample.sql.

The bottom toolbar includes tabs for OUTPUT, TERMINAL, **DEBUG CONSOLE** (active), and PROBLEMS.

Things I use



- Visual Studio Code: <https://code.visualstudio.com/>
- IBM Db2 for z/OS developer extension
<https://marketplace.visualstudio.com/items?itemName=IBM.db2forzosdeveloperextension>
- vscode REST client extension <https://github.com/Huachao/vscode-restclient>
- Rocket ported tools: Bash, cURL, vim, Git client on z/OS
<https://www.rocketsoftware.com/zos-open-source>
- Node.js for z/OS: <https://www.ibm.com/products/sdk-nodejs-compiler-zos>
- Open Enterprise Python for z/OS <https://www.ibm.com/products/open-enterprise-python-zos>
- Db2 Z Open Automation Utilities
https://www.ibm.com/support/knowledgecenter/SSKFYE_1.0.2/example.html
- Ansible and z/OS: <https://www.ansible.com/integrations/infrastructure/ibm-zos>
- Db2 command line processor (run SQL scripts)

A favor...



- **If you like the extensions**, please show your support by
 - Downloading the extensions and give it a try
 - Recommend this replay and the extension to a friend
 - Review the extension on the VSCode marketplace
- If you have **issues, suggestions, or features** you'd like to see
 - Please engage with us on github
 - https://github.com/IBM/db2forzosdeveloperextension-about/issues?utm_source=vsmp&utm_medium=ms%20web&utm_campaign=mpdetails

Thank you!

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