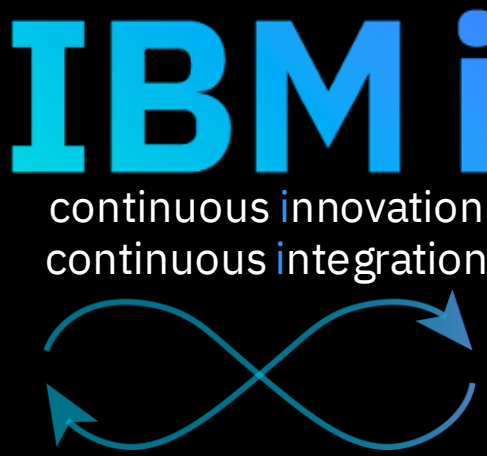
Modern, Buildable Projects
with IBM i Project Explorer and Bob



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Agenda

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- Challenges with Building on IBM I
- Bob (Better Object Builder) for IBM I
- Local Development
- IBM i Project Explorer
- Demo

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Challenges with Building on IBM i

General Challenges

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- SRC-PF
  - 10 char names
  - Fixed record length
  - Not accessible to open ecosystem, including Git and Make
  - Source of the same type stored in QxxxSRC to avoid name conflicts (member type does not disambiguate)

- Libraries
  - Only 2 level hierarchy to organize, with only short 10 char names

- Source control
  - None (sequence number dates)
  - Home grown
  - Proprietary IBM i systems
    - Cost
    - Smaller market = less investment

- Build system
  - Individual CRTXXXMOD + CRTPGM
  - CL Scripts
  - A couple of vendors have dependency-based build

RDi Projects – Lessons Learned

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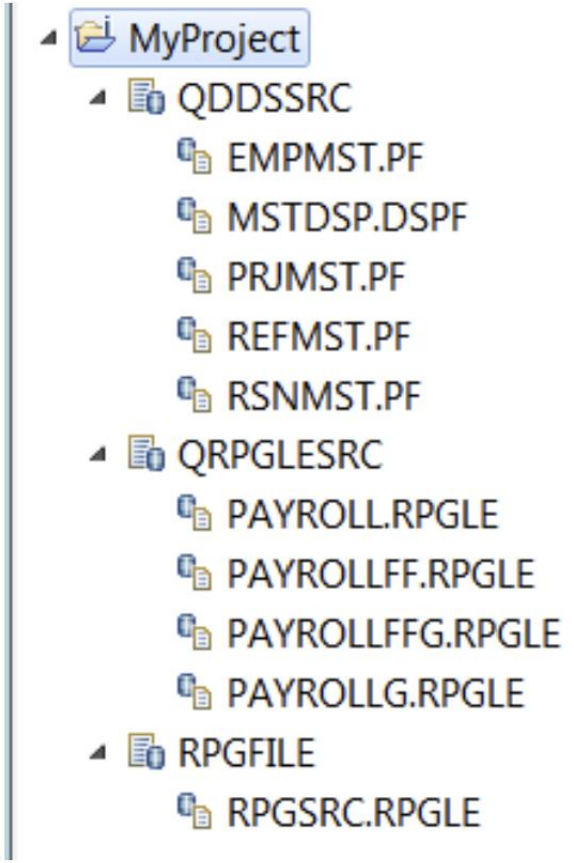
- Supports git but …

- Mapping from i Project to exactly one library was too inflexible
  - Some customers target many libraries from one project (program / data / source)
  - Other customers have huge libraries

- Metadata was very hard to maintain
  - Having a parallel directory hierarchy under .ibmi meant that any time a SRC-PF or member changed names the metadata was lost

- Mapping rigidly to SRC-PF meant inheriting all its limitations
  - Fixed line length
  - Fixed directory hierarchy of basically 1 level with only 10 characters

- Build was very limited
  - No disambiguating of PGM vs MOD
  - No understanding of binding relationships
  - No incremental ability (i.e. only build what had changed)



Existing Bob By S4i

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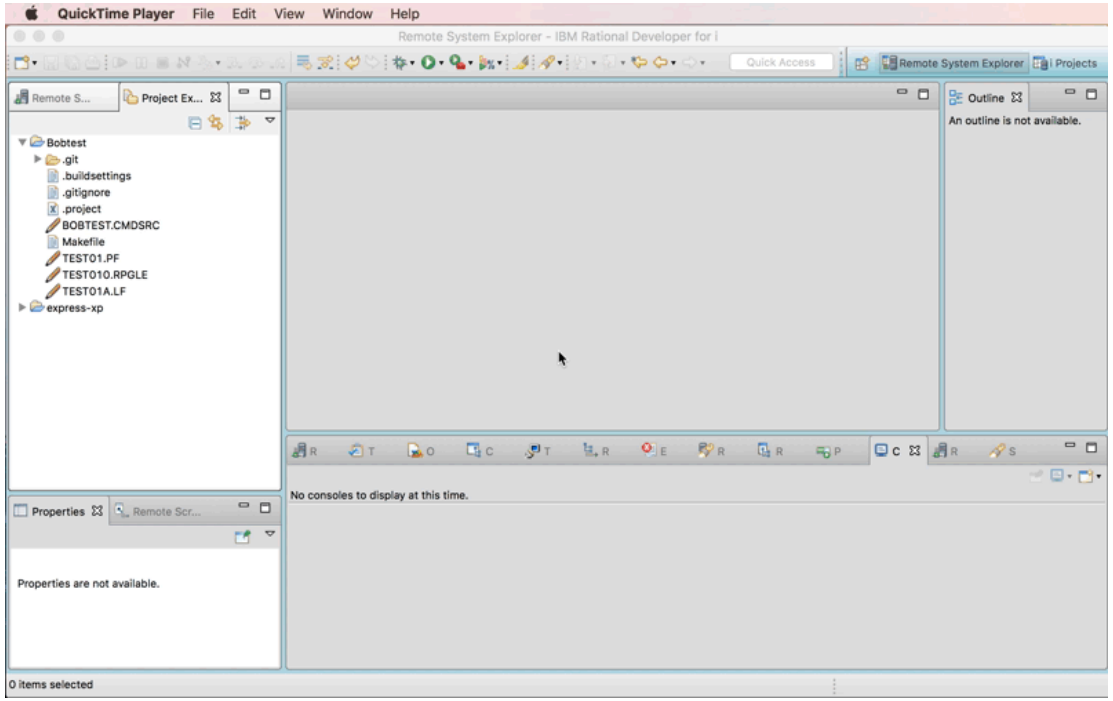
- Open-source project by Jeff Berman (https://github.com/s4isystems/Bob)
  - Incremental compile ability based on gmake
  - Some level of ILE binding understanding
  - Not bound to library and SRC-PF structure/naming
  - Member level specific metadata using gmake variable
  - Consideration of target EBCDIC CCSID for compiler
  - Support of old languages whose compilers do not have IFS support yet (DDS, UIM)
  - Retrieval of all EVFEVENT files to enable compiler feedback

- Limitations
  - Uppercase names required
  - Single target library
  - Single directory containing source
  - No metadata on environment prerequisites (i.e. LIBL, ASP, where to find includes, etc.)
  - Install was complex – not yum-enabled
  - No 1 to 1 mapping of file extensions to compile (i.e. are we targeting MOD or PGM)



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Bob (Better Object Builder) for IBM i

IBM i Bob

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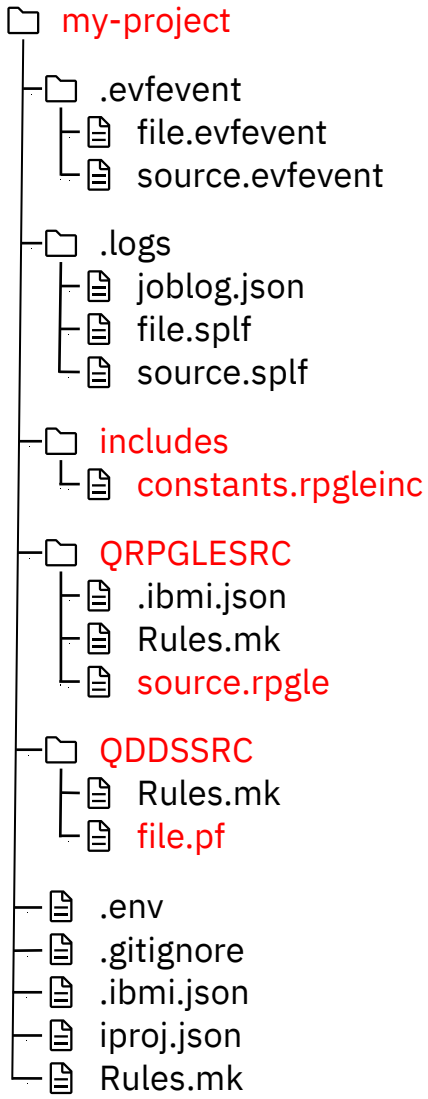
- Enhancements
  - Project definition
    - Know how to build yourself
    - Know where to resolve includes
    - Know how to set up environment
    - Still flexible so that what is stored in Git does not have to be modified for each developer or deployment scenario
  - No limit on number of directories and their nesting
  - No limit on directory naming
  - No limit on number of object libraries
  - Unambiguous mapping from file name to compile type

- Usability
  - PASE command line
  - Windows/Mac command line with rsync/scp to do file transfer
  - Any VS Code extension for IBM i development (ie. Code for IBM I and Project Explorer)
  - RDi

Project Structure (Source Code)



MYLIB

- QRPGLESRC
  - PROGRAMA.RPGLE
  - PROGRAMB.RPGLE
  - PROGRAMC.RPGLE
- QSQLSRC
  - CUSTOMERS.SQL
  - INVENTORY.SQL
- QCLLESRC
  - STARTJOB.CLLE
- QCMDSRC
  - STARTJOB.CMD

Project Structure (Metadata)

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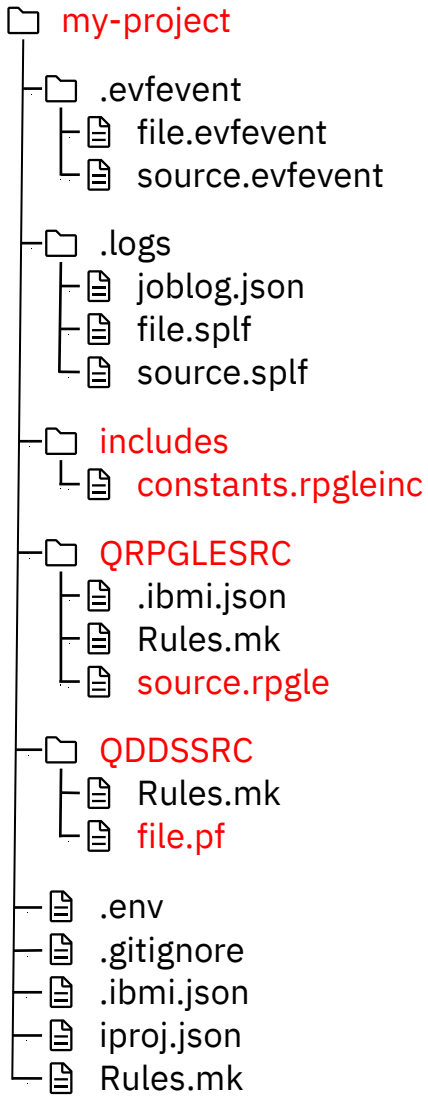

Project Structure (Build/Compile Output)

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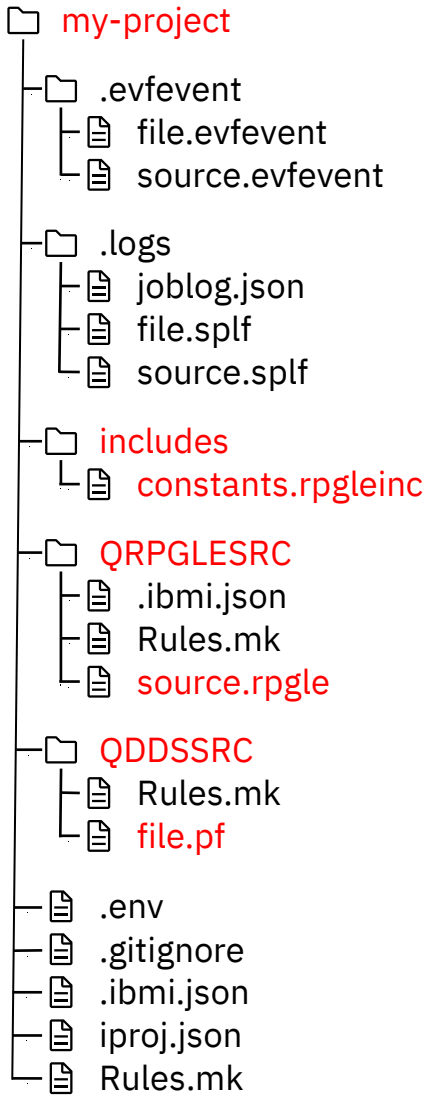

Project Structure (Rules.mk)

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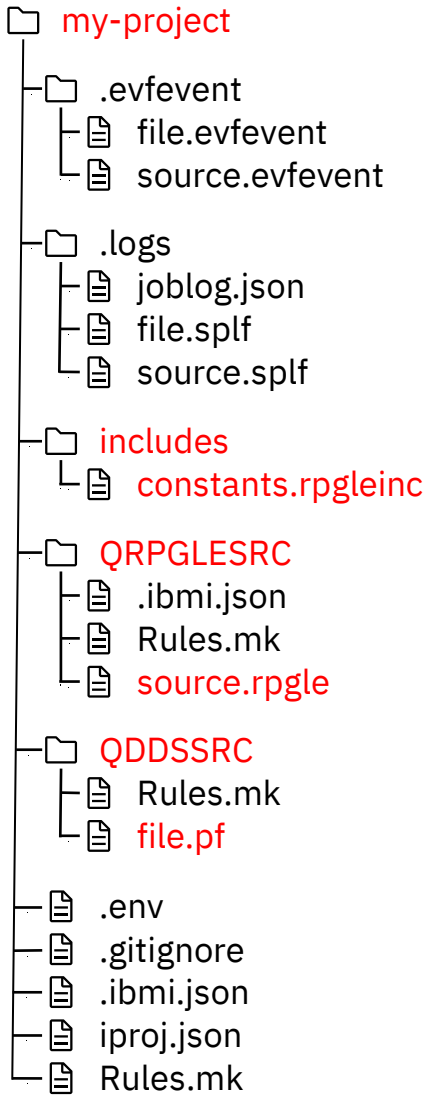

Build and Compile Process

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Command	Description
makei init	Create iproj.json
makei cvtsrcpf	Convert QSYS members to Unicode IFS stream files
makei build	Build the entire project
makei b –t <object>	Build target object
makei b –d <directory>	Build all objects in the specified directory (based on Rules.mk)
makei compile -f <stream file>	Compile target object of specified stream file
makei compile –files file1: file2: …	Compile target objects of all specified stream files

- A

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Local Development

Different (But Similar) File System

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MYLIB
- QRPGLESRC
  - PROGRAMA.RPGLE
  - PROGRAMB.RPGLE
  - PROGRAMC.RPGLE
- QSQLSRC
  - CUSTOMERS.SQL
  - INVENTORY.SQL
- QCLLESRC
  - STARTJOB.CLLE
- QCMDSRC
  - STARTJOB.CMD

/COPY and /INCLUDE

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Distributed Development

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Version Control with Git

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Development with Git

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IBM i Project Explorer

Overview

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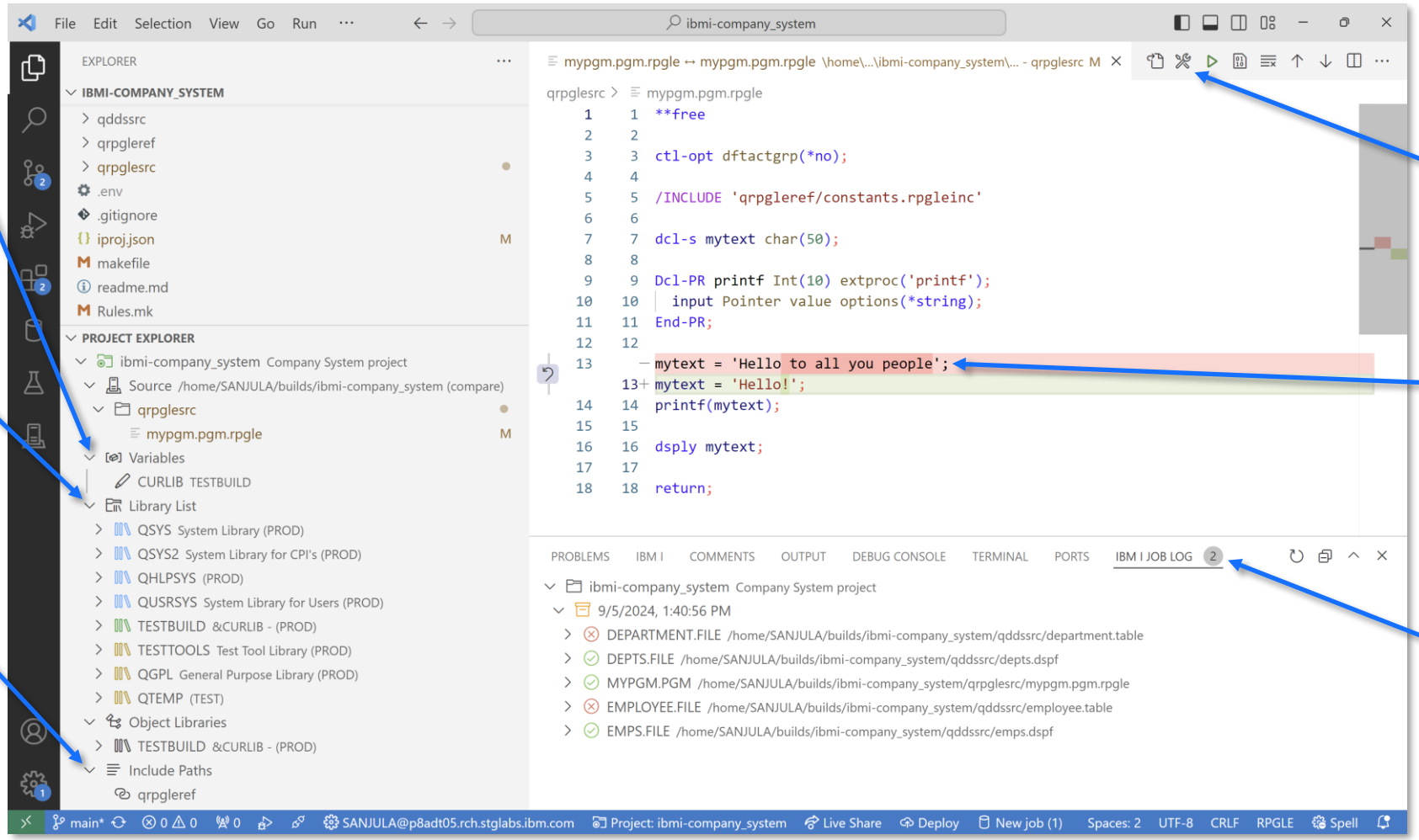
The ultimate tool for local development on IBM i!

Set variables

Manage library list

Modify include paths



Build and Compile

Local source vs. IFS source

View job logs

Installation

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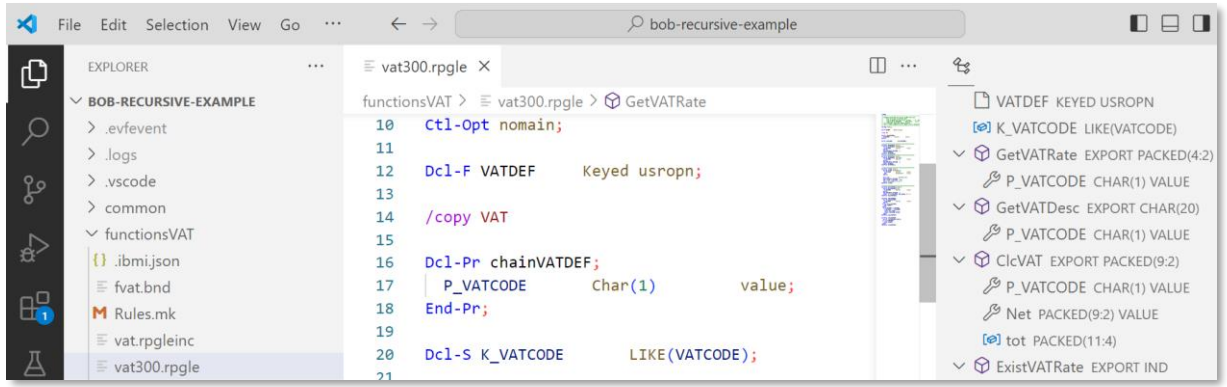
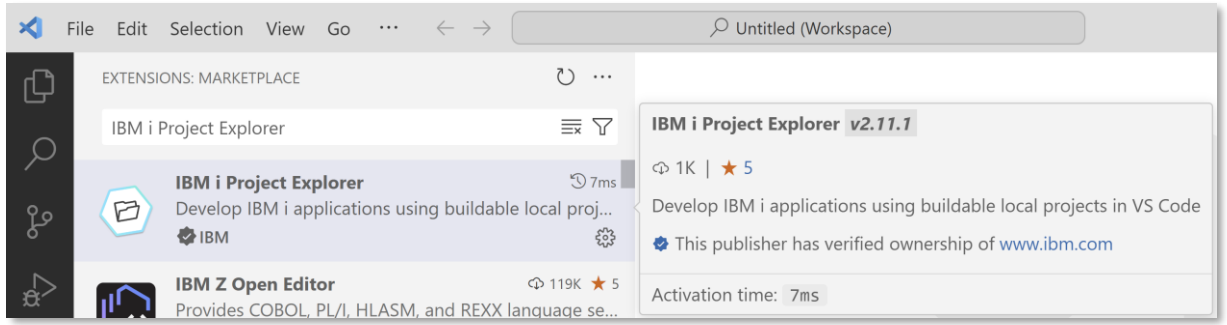
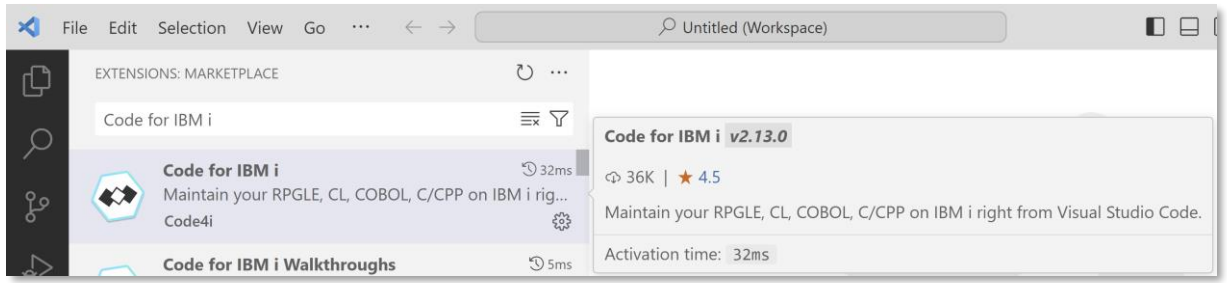
1 *Download*
Visual Studio Code



2 *Download*
IBM i Project Explorer



3 *Download*
Code for IBM i



Create a New Project

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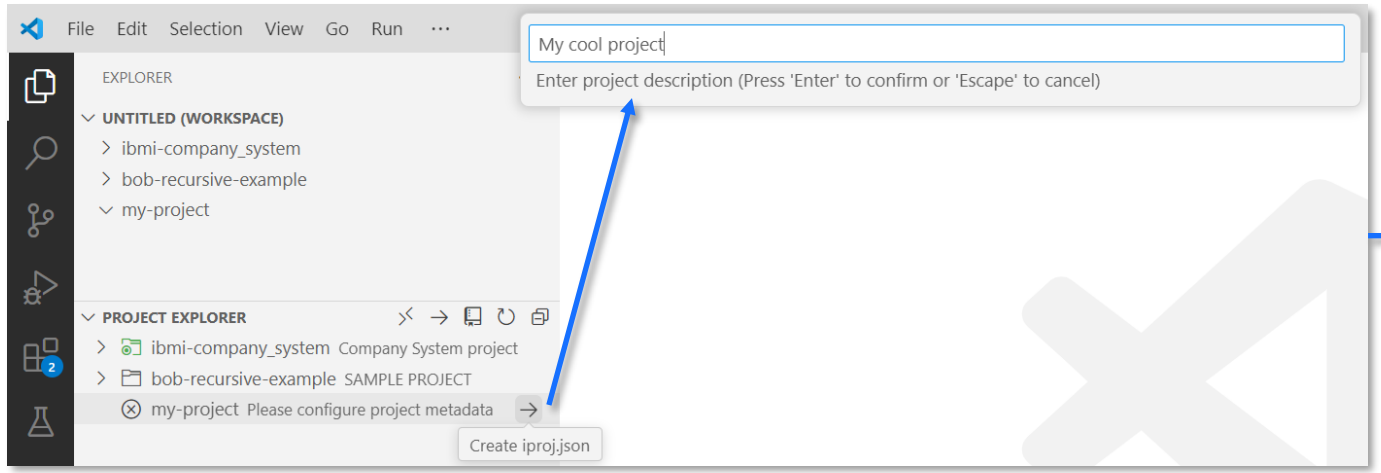
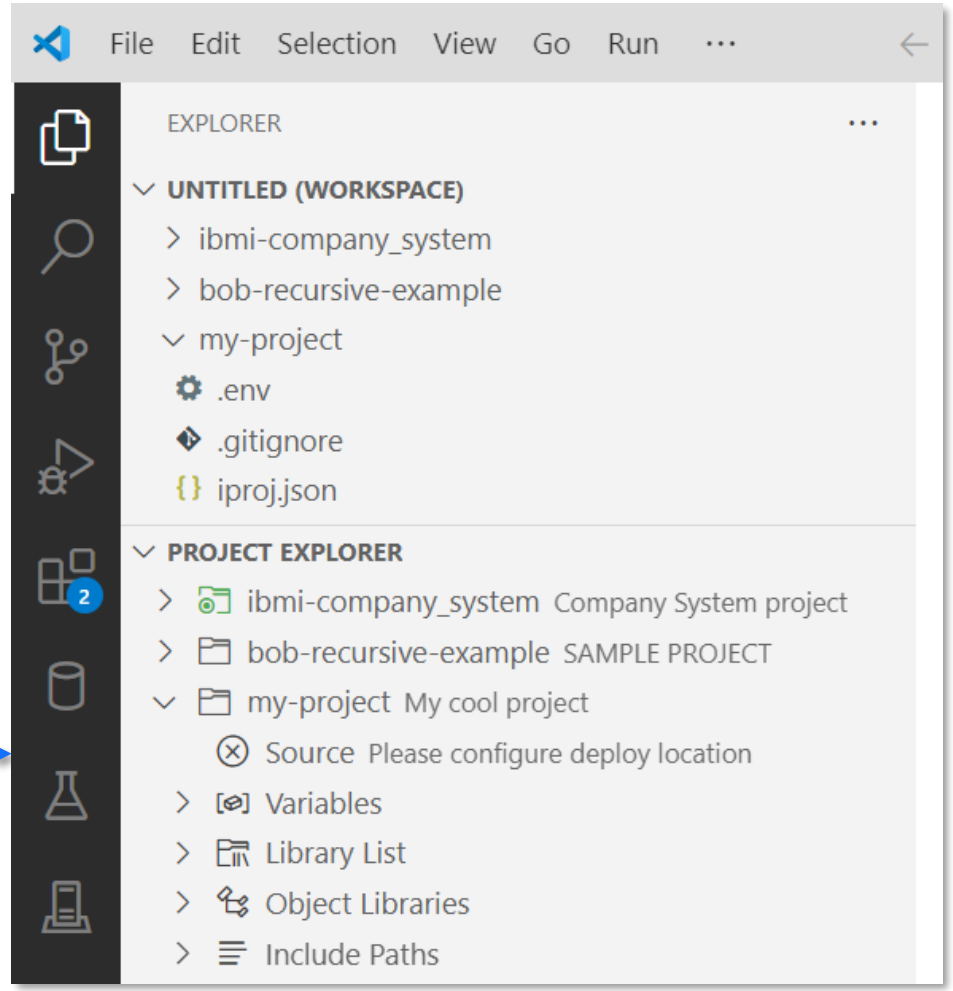
- Create and open a folder for your project
- Create an iproj.json
- Set the project description
- Connect to an IBM i (using Code for IBM i)





Migrate Source from QSYS

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CVTSRCPF from BOB

QSYS members in source physical files

↓

Properly encoded, terminated, and named source files in an IFS directory

↓

Download to local project

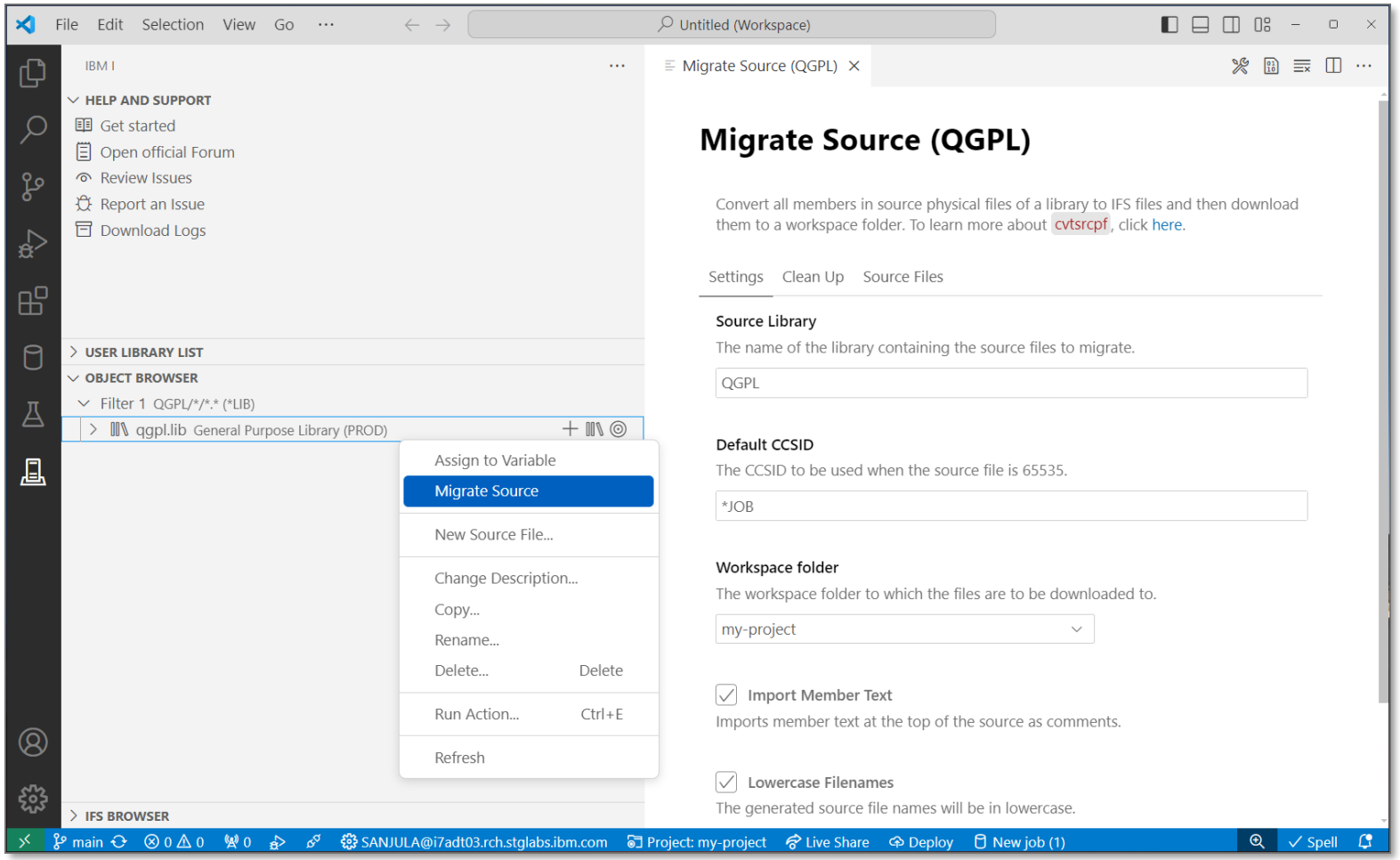
↓

Source Orbit

Rename extensions

↓

Convert includes/copy directives to Unix style paths



Source and Deployment

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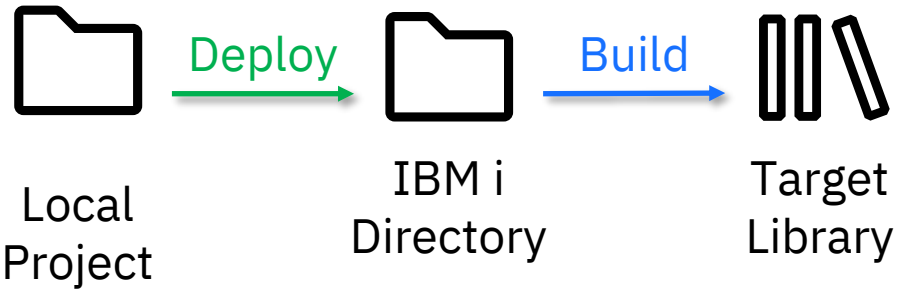
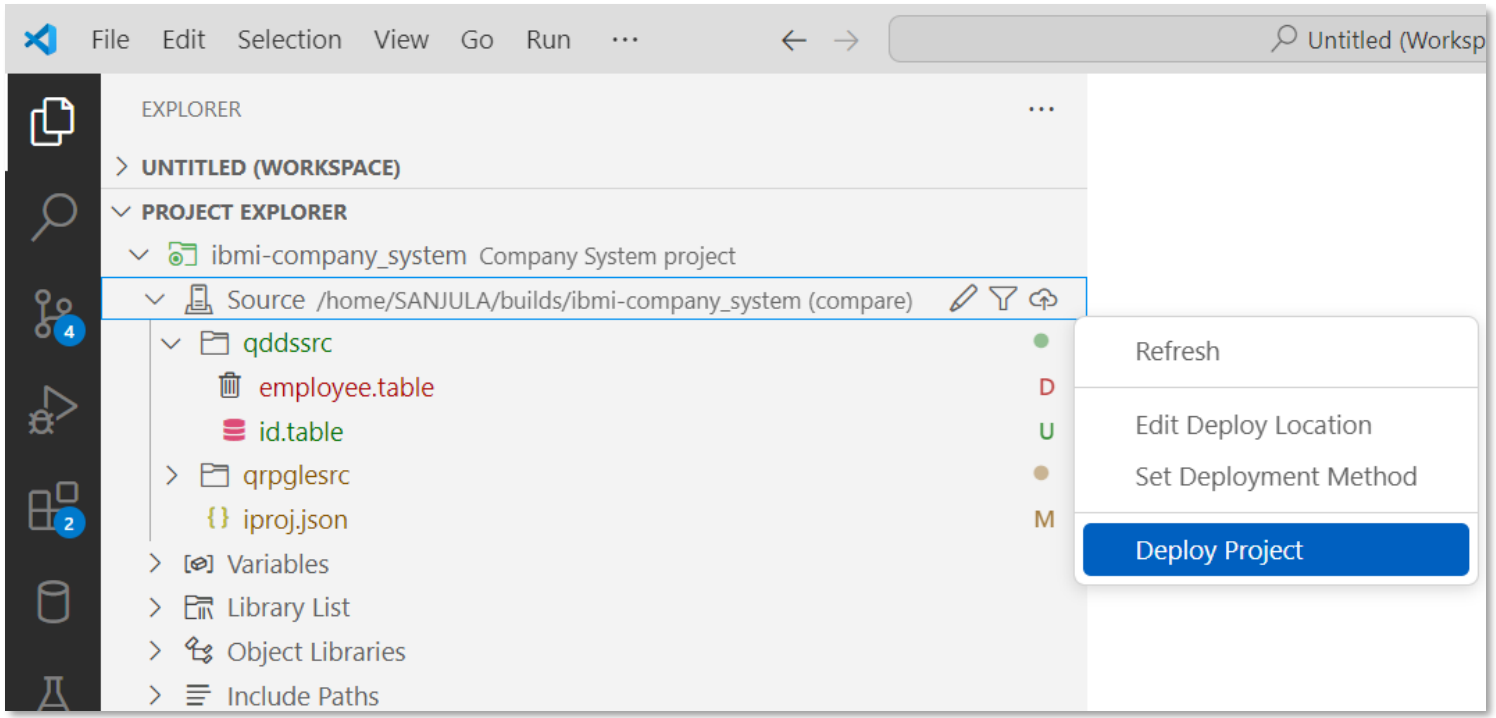
- Set deploy location
  - Where source gets uploaded to
  - Typically set one
  - Each developer gets a unique location
  - Each repository gets a unique location
- Set deployment method
  - Compare (typically the safest)
  - Changes
  - Working Changes
  - Staged Changes
  - All
- Deploy project
  - Moves files to deploy location based on deployment method





Work with Variables

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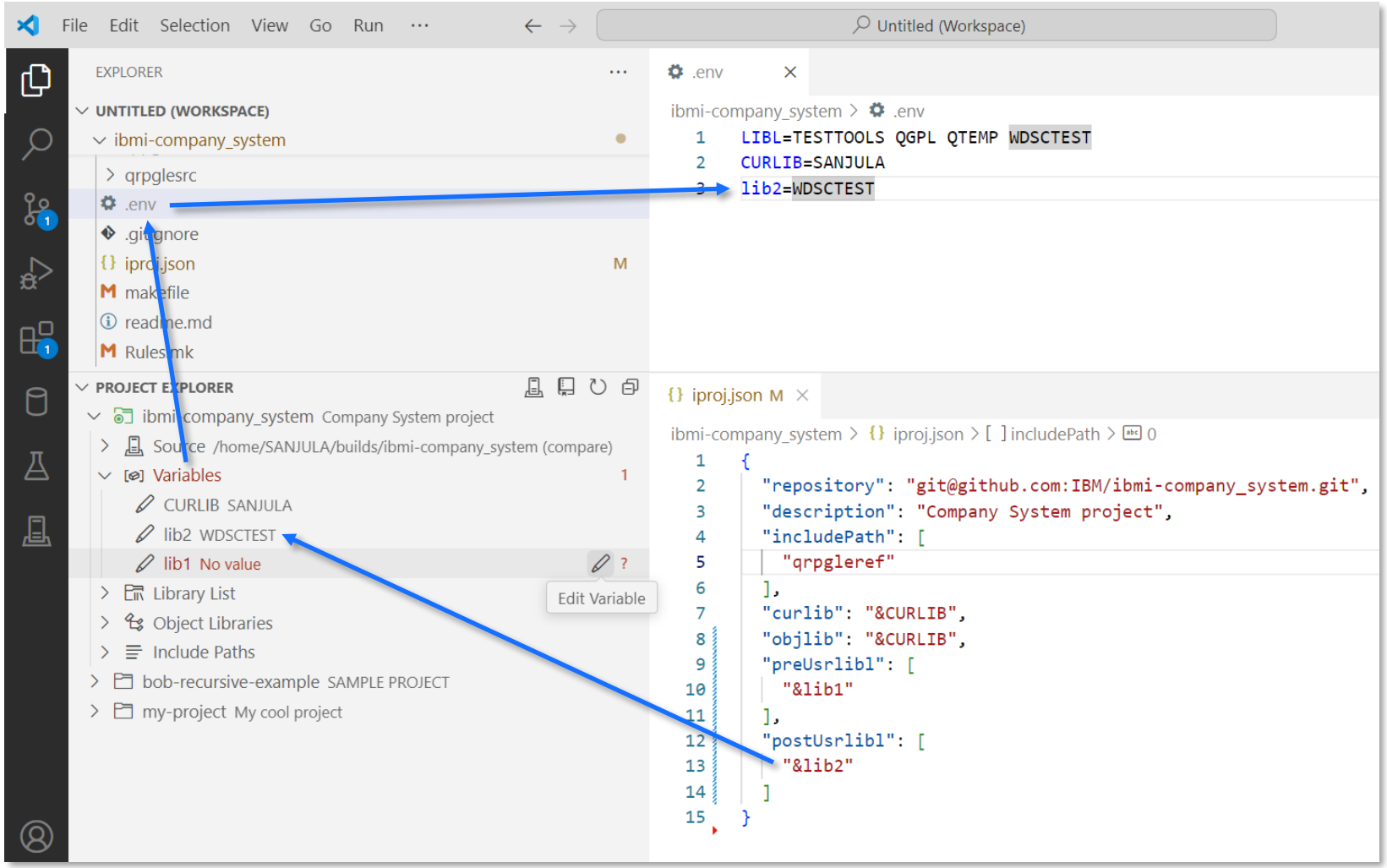
- View and set variables (for libraries, include paths, or build/compile commands)
- Browse for libraries and assign values to variables
- Configure hardcoded values as variables

Do not push .env file to Git!



Manage the Library List

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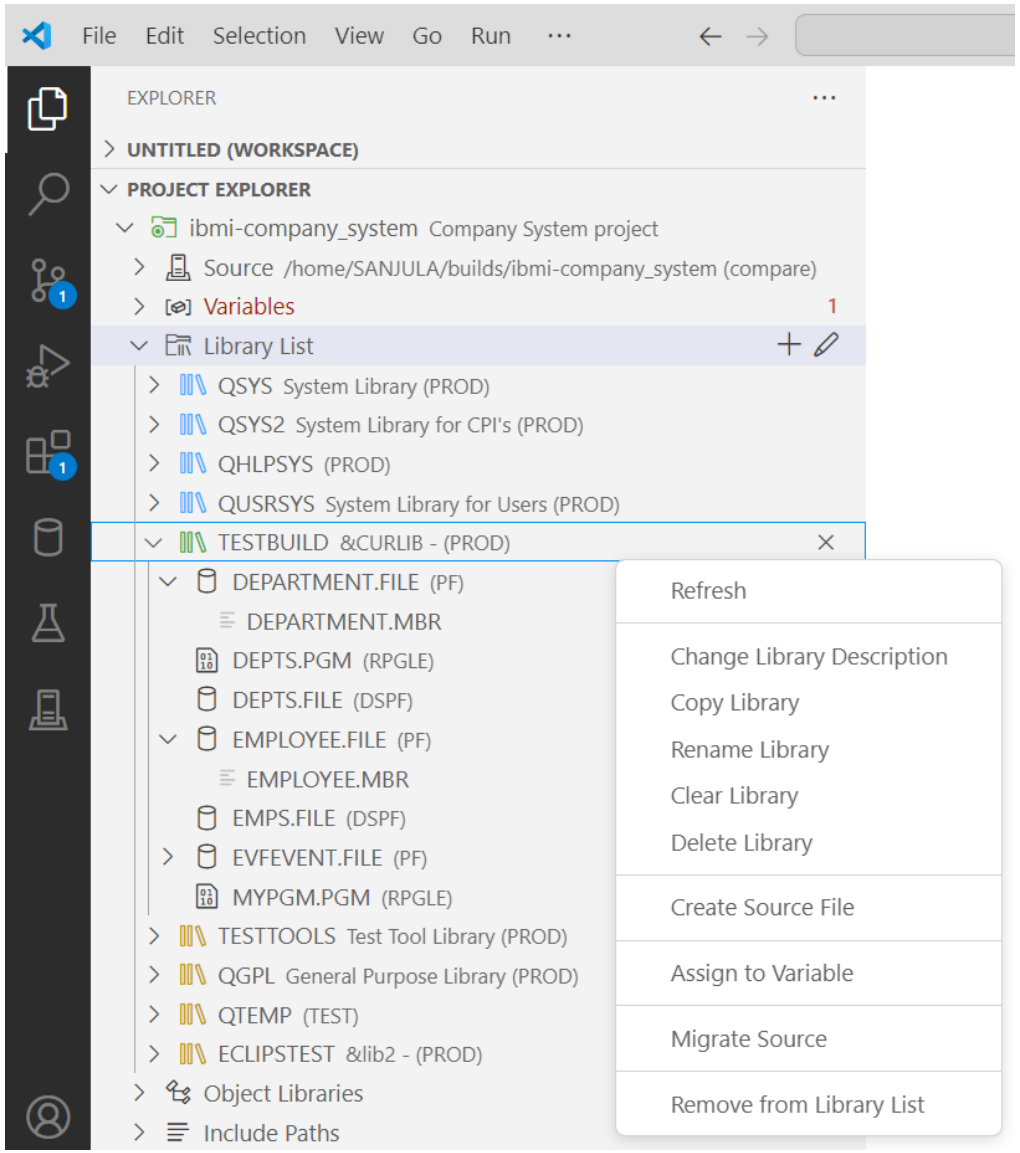
- Add to beginning/end of library list (preUsrlibl and postUsrlibl) and set current library (curlib in iproj.json)
- Reorder library list
- Browse objects and members
- Manage libraries, objects, and members



Browse Object Libraries

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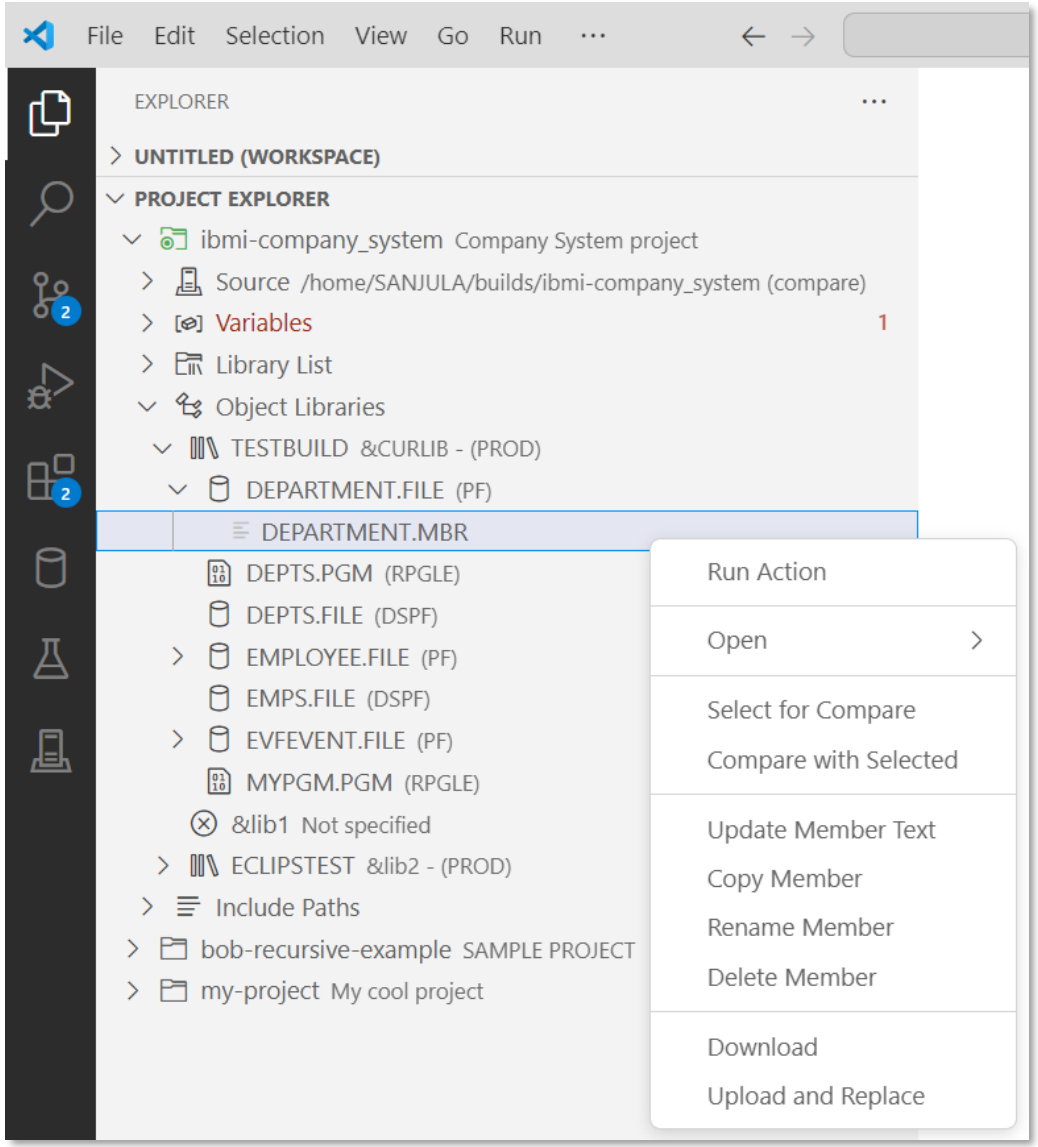
- Another place to manage libraries in iproj.json (curlib, objlib, preUsrlibl, postUsrLibl)
- Manage libraries, objects, and members



Manage Include Paths

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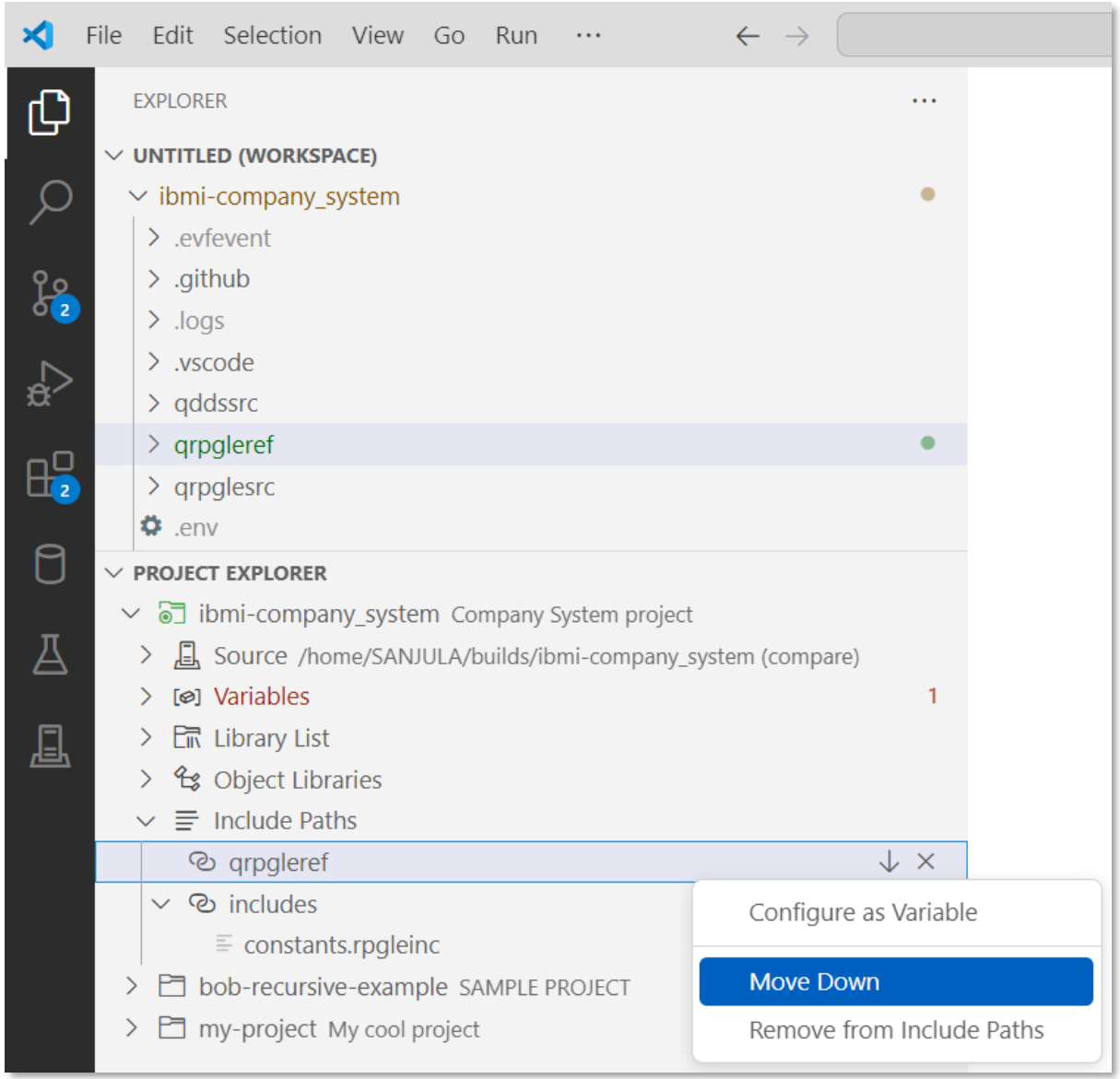
- Add, remove, and reorder include paths
- Visualize if includes resolve locally or to remote IFS



Build and Compile

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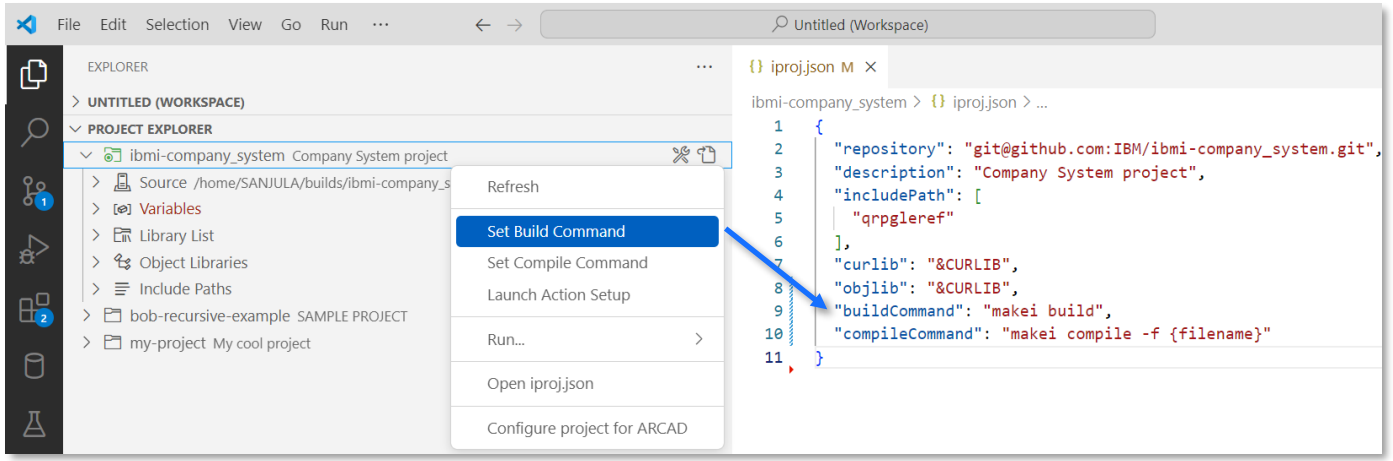
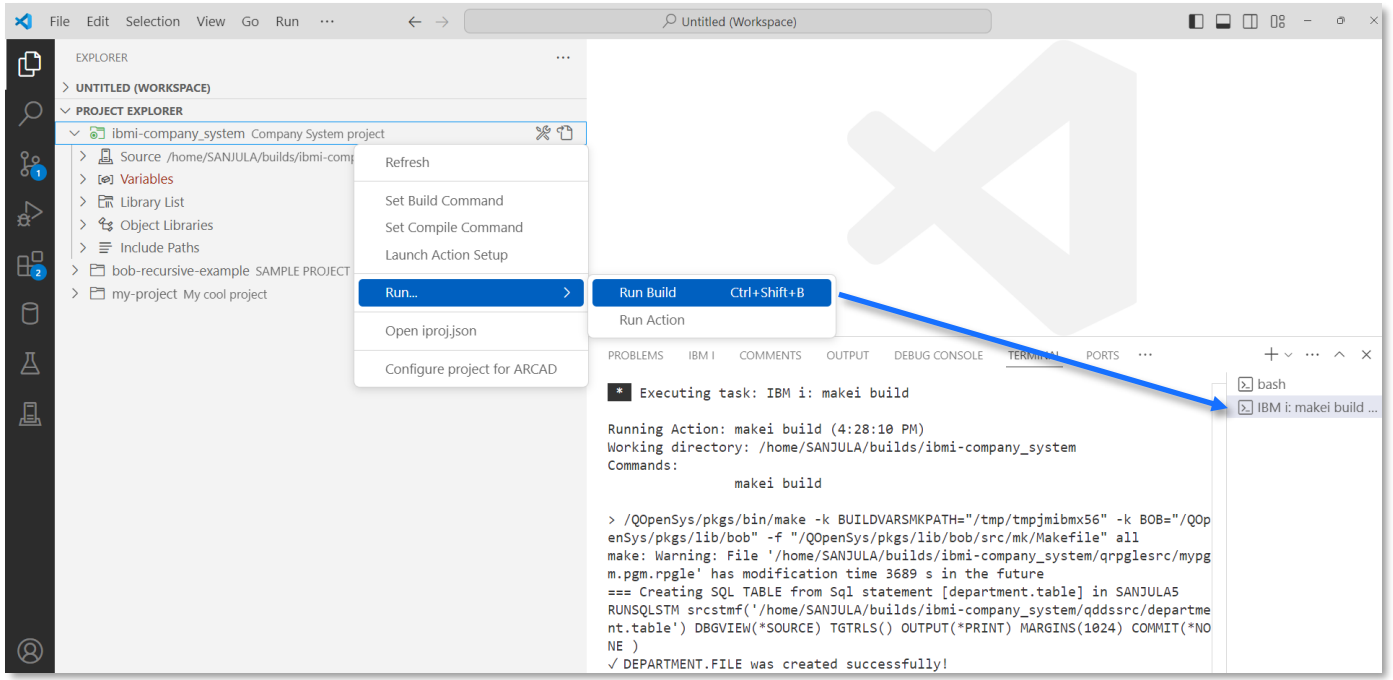
1. Deploy
↓
2. Run build or compile command
↓
3. Download logs and evfevent files



- Building
  - Set build command
  - Run Build
- Compiling
  - Set compile command
  - Run compile
    - On active editor
    - On file or directory in File Explorer
    - On file or directory in Source



Run Actions

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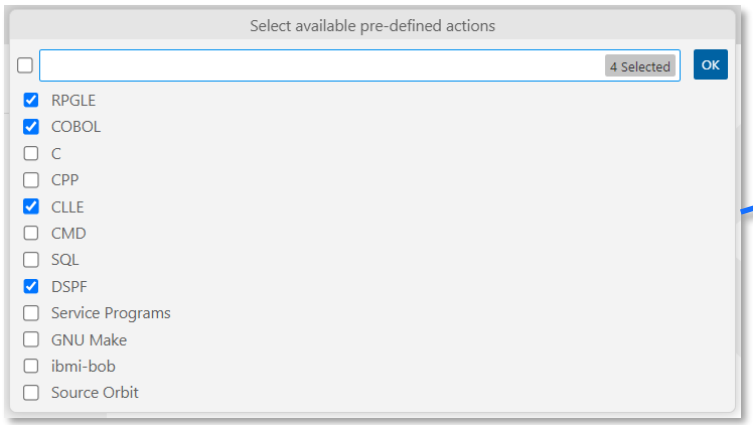
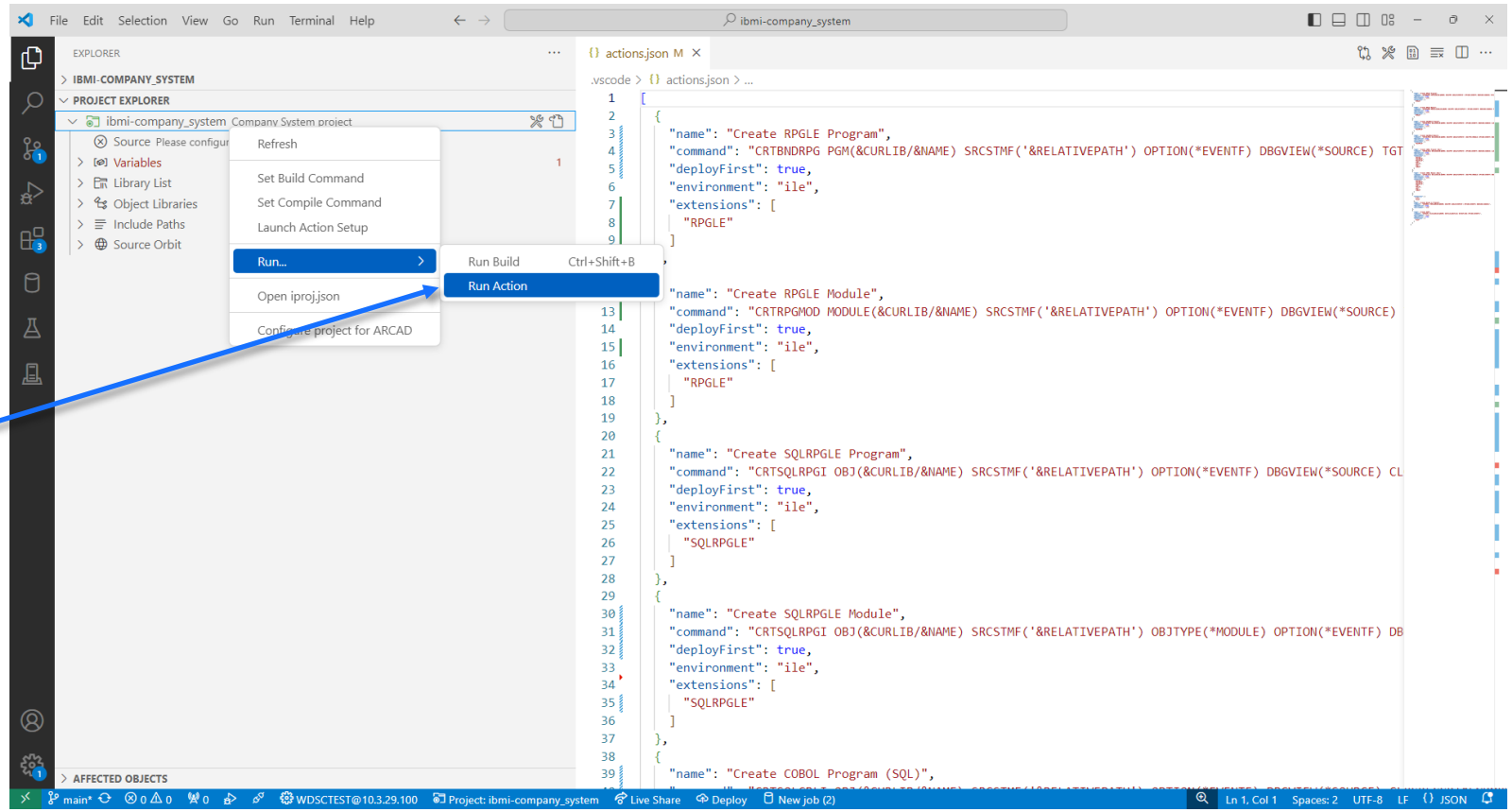
Run Code for IBM i's custom workspace actions to have more control of the command which is executed





View Diagnostics

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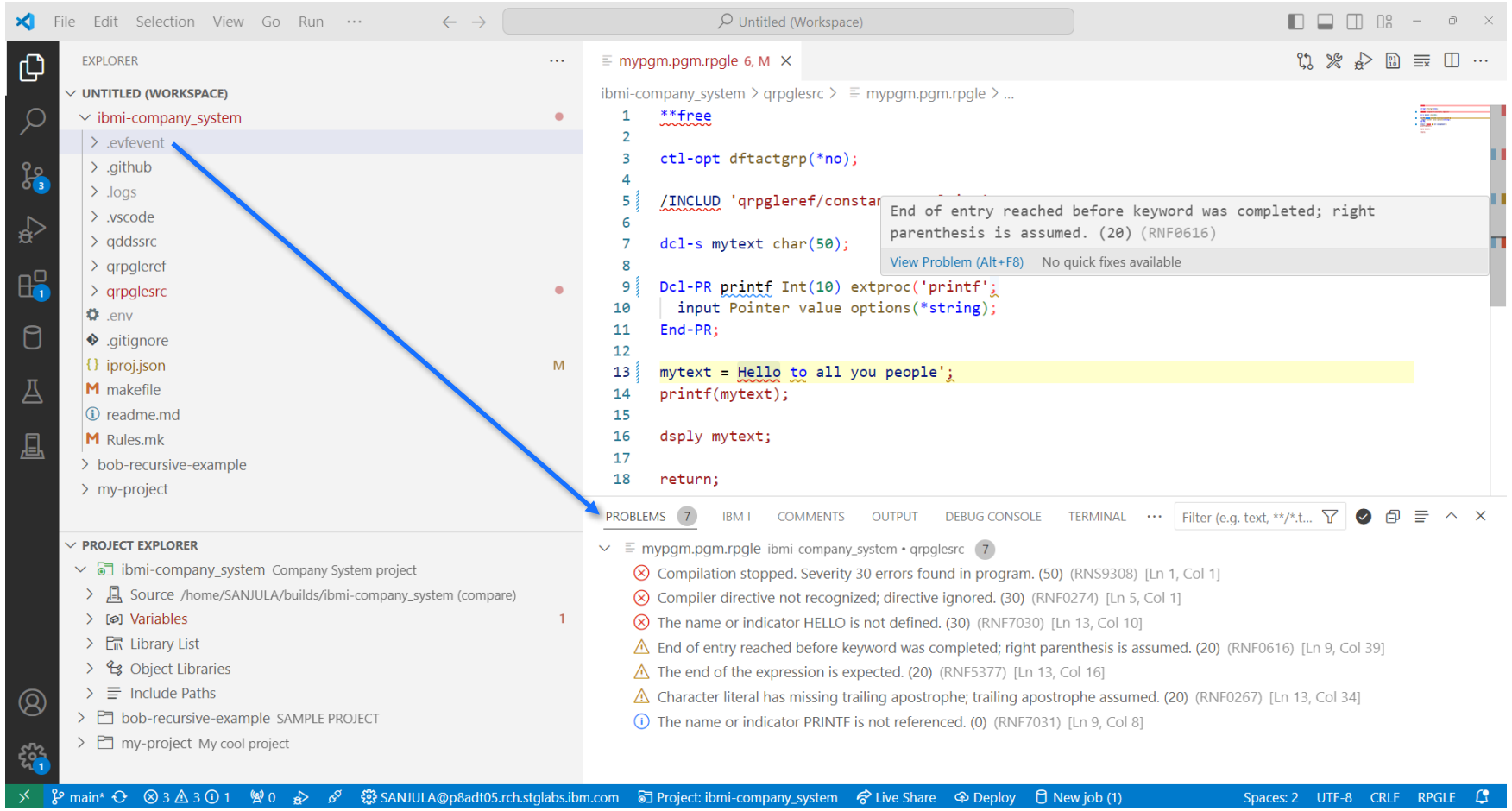
- Evfevent file diagnostics are dumped in .evfevent directory after a build or compile
- Visualize diagnostics in the Problems view
- Diagnostics are also rendered inline in the source file



View Job Logs

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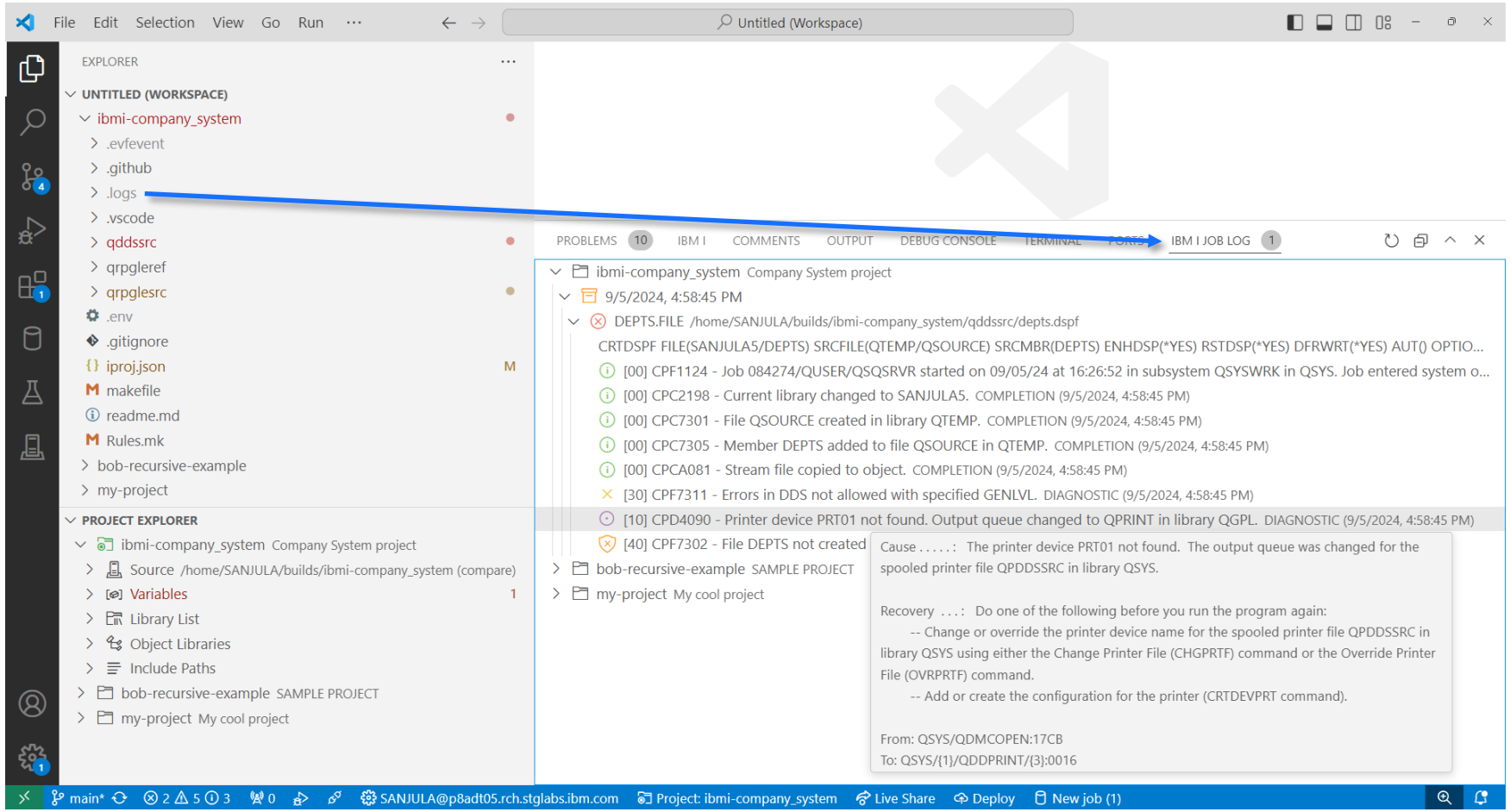
- Job log and spool files are dumped in .logs directory after a build or compile
- Job log view is used to visualize and mangae these logs
- Track up to 10 of the previous logs in memory
- Organized by the ILE objects being built
- Filter by failed objects or severity



Integration

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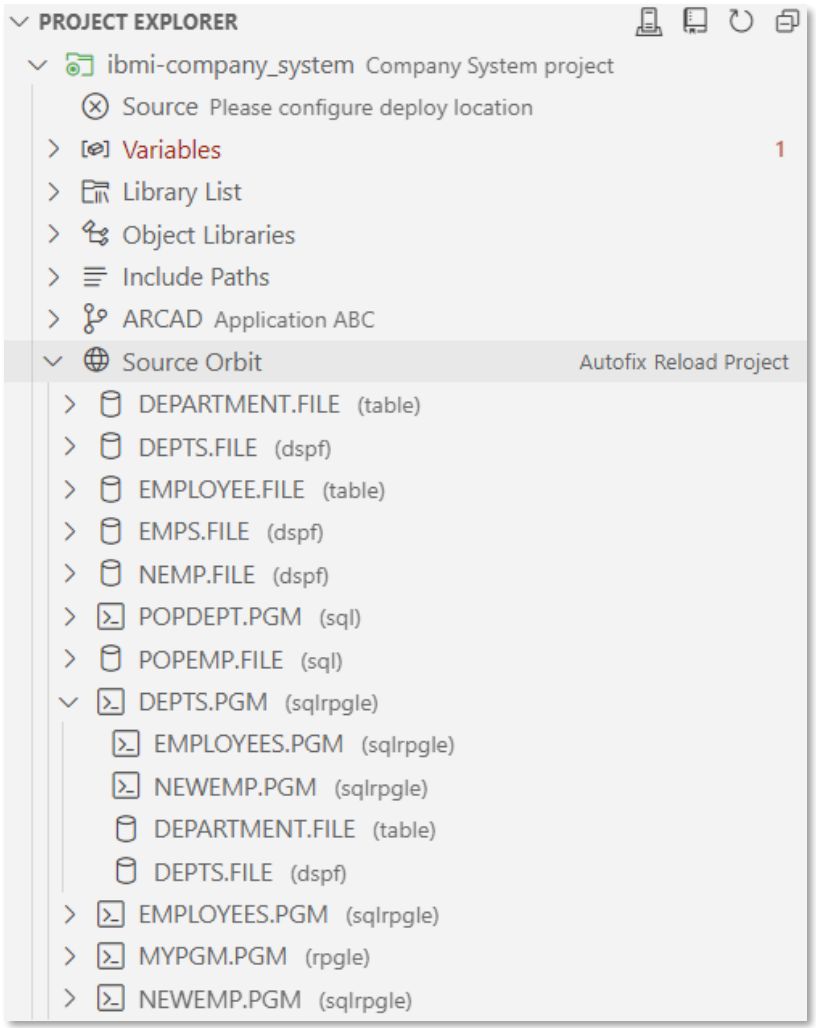
Source Orbit



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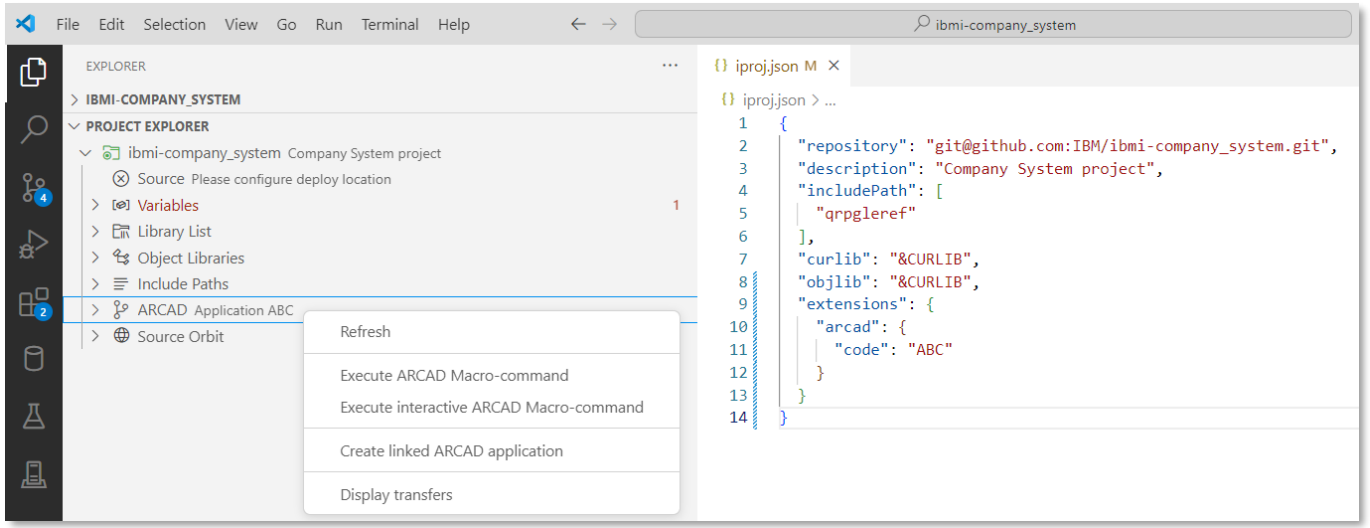
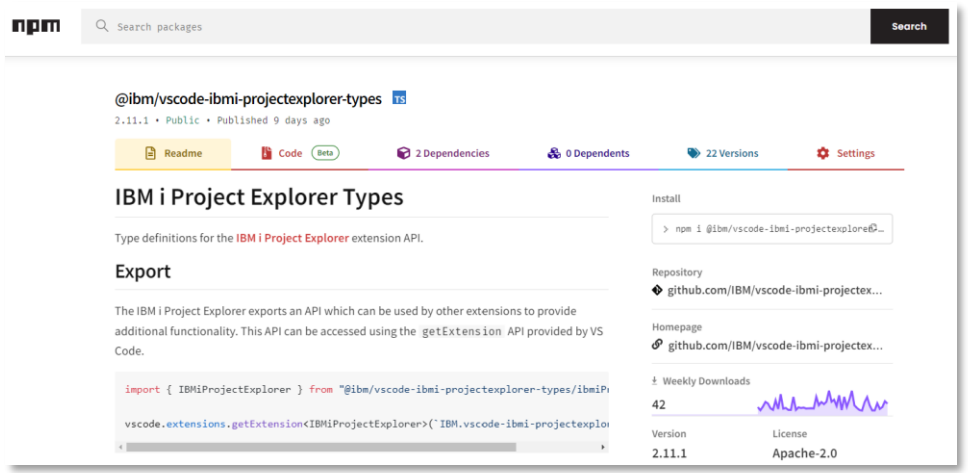


What can you integrate with IBM i Project Explorer's API?



Demo

Links

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IBM i Project Explorer

- VS Code Marketplace https://marketplace.visualstudio.com/items?itemName=IBM.vscode-ibmi-projectexplorer
- Documentation https://ibm.github.io/vscode-ibmi-projectexplorer/#/
- GitHub Repository https://github.com/IBM/vscode-ibmi-projectexplorer
- API https://www.npmjs.com/package/@ibm/vscode-ibmi-projectexplorer-types

Bob

- Documentation https://ibm.github.io/ibmi-bob/#/
- GitHub Repository https://github.com/IBM/ibmi-bob

Code for IBM i

- VS Code Marketplace https://marketplace.visualstudio.com/items?itemName=HalcyonTechLtd.code-for-ibmi
- Documentation https://codefori.github.io/docs/#/
- GitHub Repository https://github.com/codefori/vscode-ibmi
- API https://www.npmjs.com/package/@halcyontech/vscode-ibmi-types