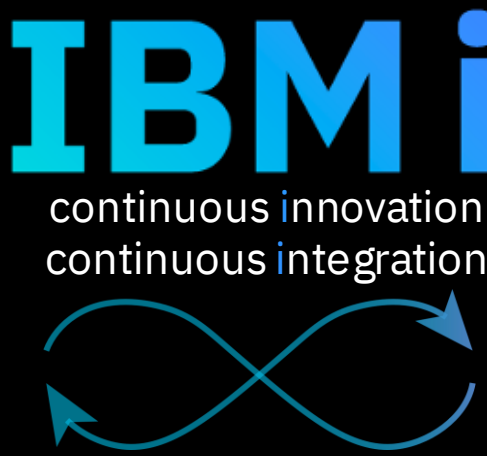
Modern, Buildable Projects
with IBM i Project Explorer and Bob



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Agenda

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- Challenges with Building on IBM i
- How do IBM i Projects and Bob overcome this?
- Ins and Outs of IBM i Project Explorer
- Demo

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Challenges with Building on IBM i

Building on IBM i is hard...

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1. 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)

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

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

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

How do IBM i Projects and Bob overcome this?

Let's use a different (but similar) file system

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

QSYS.LIB Library

No more character name restrictions

Now usable with Git and Make

Flexible directory structure

/my-project
- /.git
- qrpglesrc
  - programa.rpgle
  - programb.rpgle
  - programc.rpgle
- qsqlsrc
  - customers.sql
  - inventory.sql
- qcllesrc
  - start.clle
- qcmdsrc
  - Startjob.cmd

IFS/Local File System

Unlocking source control with Git

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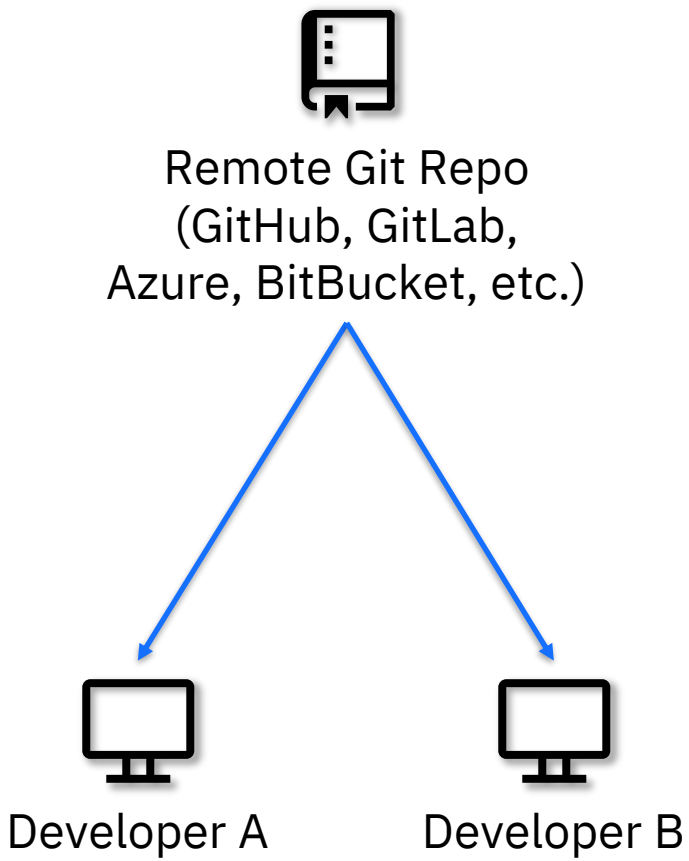
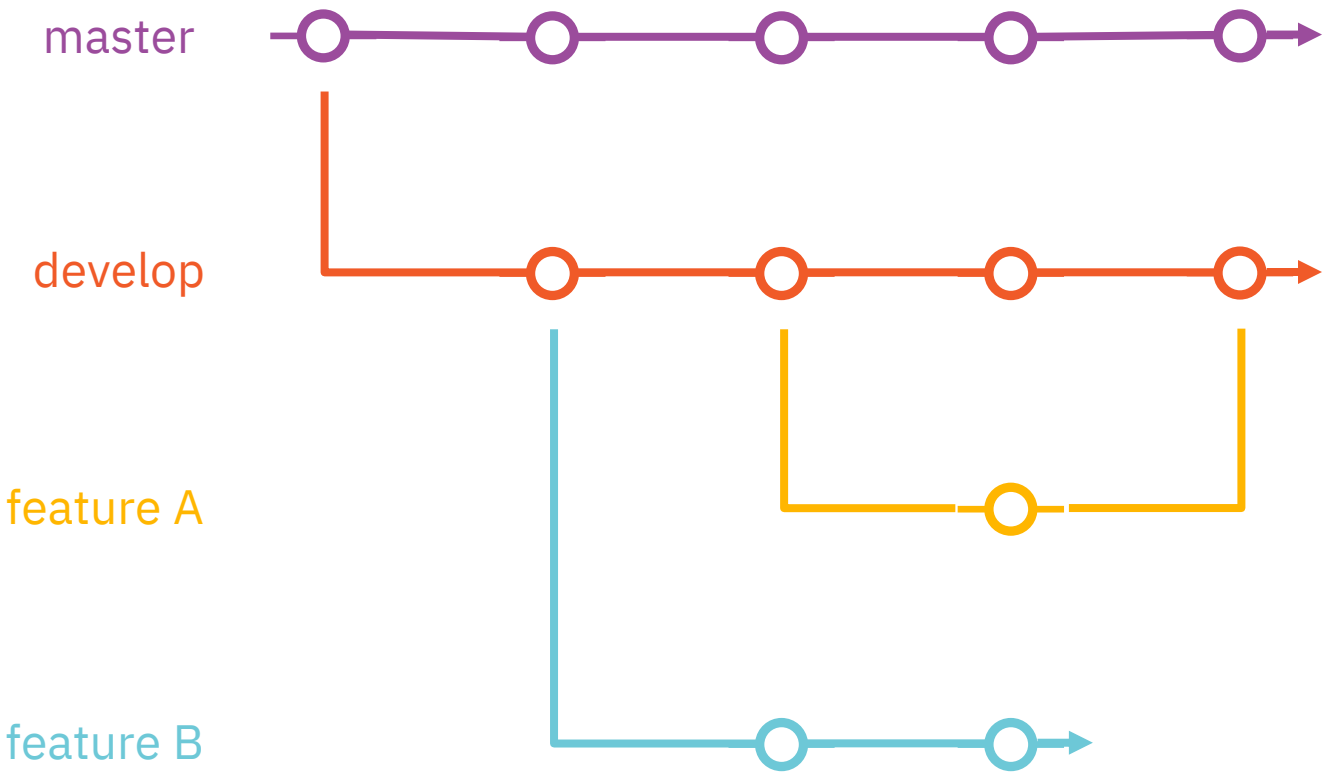
Distributed Development



Version Control and Git Workflow



Projects that self-describe how to build themselves!?

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- my-project
  - .evfevent
    - file.evfevent
    - source.evfevent
  - .logs
    - joblog.json
    - file.splf
    - source.splf
  - includes
    - constants.rpgleinc
  - QRPGLESRC
    - .ibmi.json
    - Rules.mk
    - source.rpgle
  - QDDSSRC
    - Rules.mk
    - file.pf
  - .env
  - .gitignore
  - .ibmi.json
  - iproj.json
  - Rules.mk

Project Information

Configure library list

Configure build/compile environment

iproj.json

```
{
    "version": "0.0.1",
    "description": "SAMPLE PROJECT",
    "repository": "https://github.com/edmundreinhardt/bob-recursive-example.git",
    "license": "Apache 2.0",
    "objlib": "&CURLIB",
    "curlib": "&CURLIB",
    "includePath": [
        "includes",
        "QPROTOSRC"
    ],
    "preUsrlibl": [
        "&lib1"
    ],
    "postUsrlibl": [
        "&lib2"
    ],
    "setIBMiEnvCmd": [],
    "compileCommand": "makei c -f {filename}",
    "buildCommand": "makei build"
}
```

Standardized metadata format with variables (&...)

Set build/compile command

iproj.json in project root

Flexible subdirectories and build customization

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- my-project
  - .evfevent
    - file.evfevent
    - source.evfevent
  - .logs
    - joblog.json
    - file.splf
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    - Rules.mk
    - file.pf
  - .env
  - .gitignore
  - .ibmi.json
  - iproj.json
  - Rules.mk

.ibmi.json

```
{
    "version": "0.0.1",
    "build": {
        "tgtCcsid": "273",
        "objlib": "&lib3"
    }
}
```

EBCDIC encoding for compiler

Target object library for directory

.ibmi.json in project root or subdirectories

.env

```
LIBL=QGPL QTEMP QDEVELOP QBLDSYS QBLDSYSR
CURLIB=SANJULA
lib1=MYLIB
lib2=ABCLIB
lib3=APILIB
```

Custom variable values so that each developer can customize build

.env in project root

Control what objects to build and how to build them

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- my-project
  - .evfevent
    - file.evfevent
    - source.evfevent
  - .logs
    - joblog.json
    - file.splf
    - source.splf
  - includes
    - constants.rpgleinc
  - QRPGLESRC
    - .ibmi.json
    - Rules.mk
    - source.rpgle
  - QDDSSRC
    - Rules.mk
    - file.pf
  - .env
  - .gitignore
  - .ibmi.json
  - iproj.json
  - Rules.mk

Rules.mk

```
1   SUBDIRS = qrpglesrc qddssrc
```

Rules.mk in project root

Declare subdirectories to be built

Rules.mk

```
1   FVAT.SRVPGM: fvat.bnd VAT300.MODULE
2   FVAT.SRVPGM: TEXT = Functions VAT
3   FVAT.SRVPGM: private TEXT = Functions VAT
4
5   VAT300.MODULE: vat300.rpgle QPROTOSRC/vat.rpgleinc VATDEF.FILE
6   VAT300.MODULE: private TEXT := bound into FVAT.SRVPGM
7   VAT300.MODULE: private DBGVIEW ::= *SOURCE
8
9   VATDEF.FILE: vatdef.pf SAMREF.FILE
```

Rules.mk in subdirectories

Makefile with list of objects to be built and from which source files

Build and Compile Process

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Initialization and Migration

Command	Description
makei init	Create iproj.json
makei cvtsrcpf	Convert QSYS members to Unicode IFS stream files

Building

Command	Description
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)

Compiling

Command	Description
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

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Ins and Outs of IBM i Project Explorer

Overview

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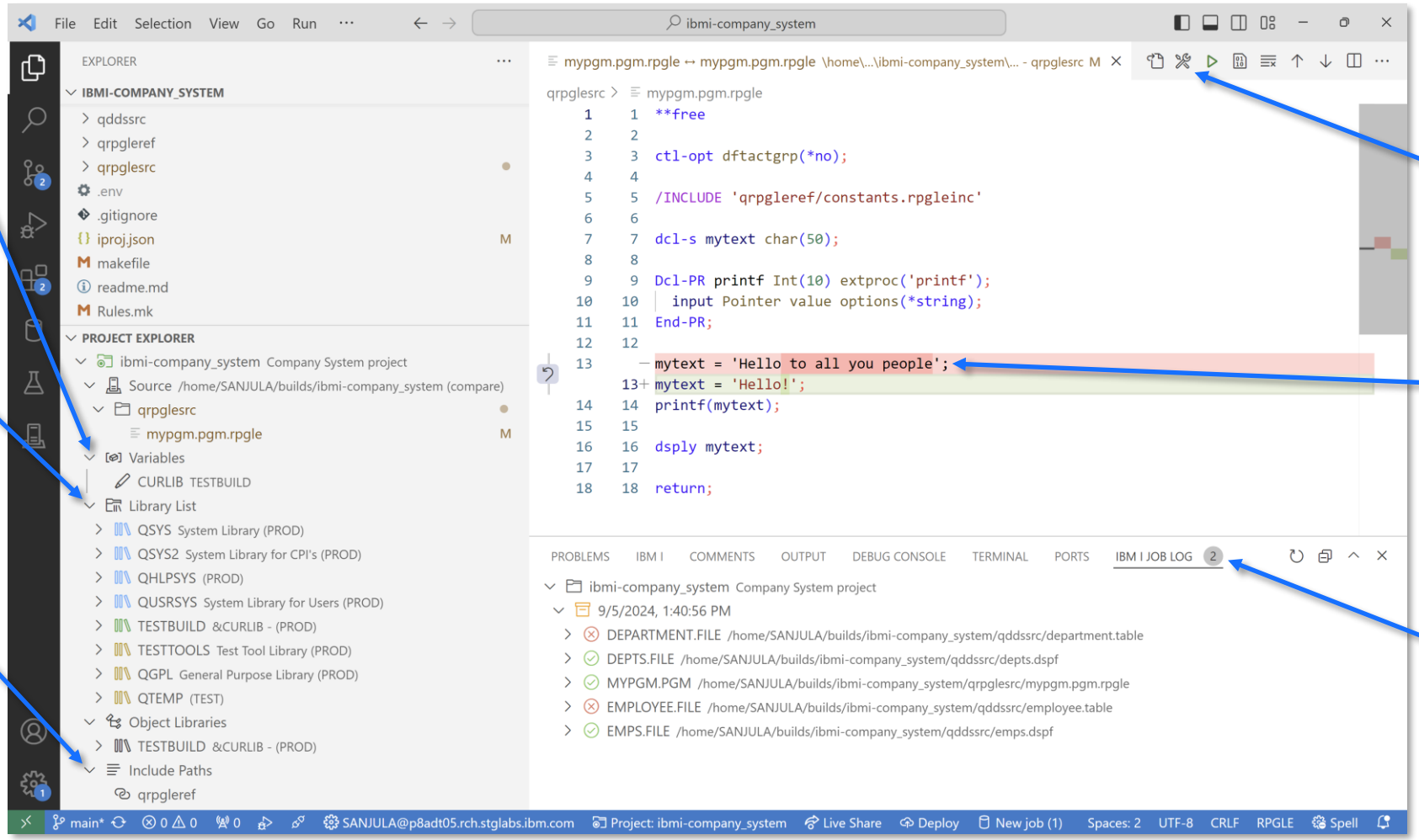
The ultimate tool for local development on IBM i!

Set variables

Manage library list

Modify include paths



Build and Compile

Local source vs. IFS source

View job logs

Installation

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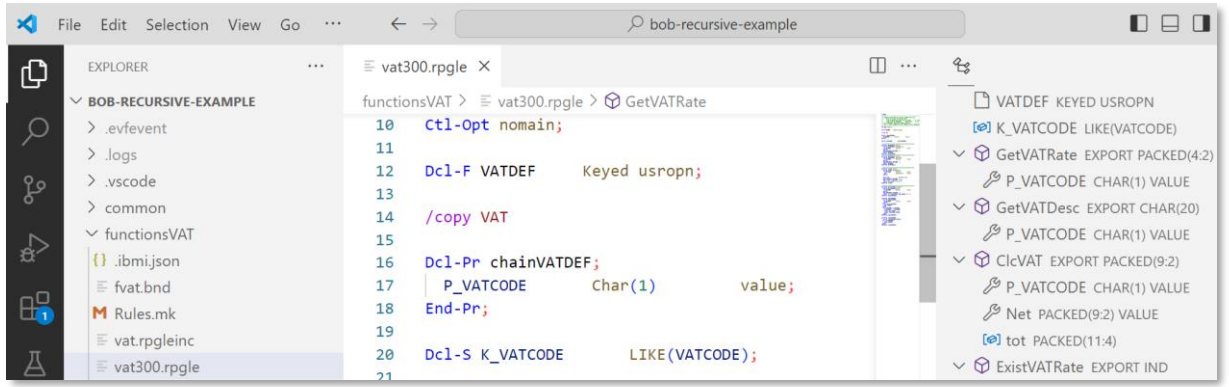
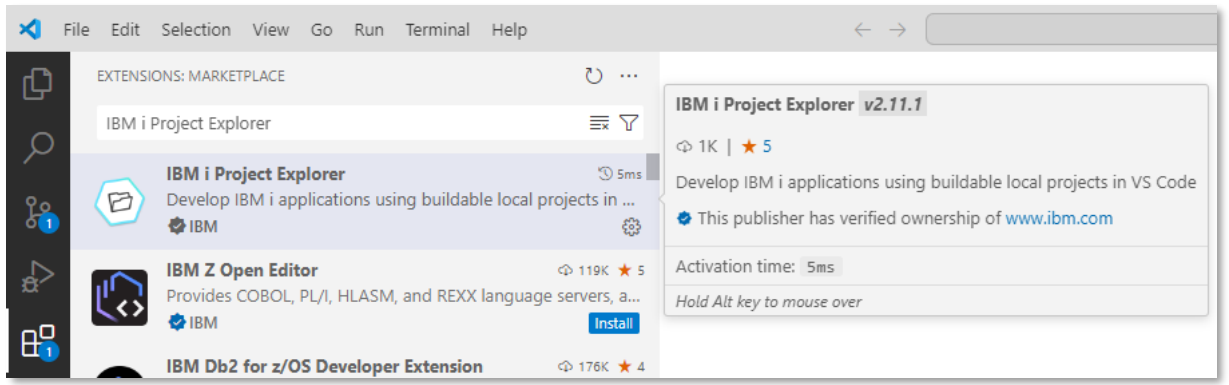
1 *Download*
Visual Studio Code



2 *Download VS Code extensions*
IBM i Project Explorer and
Code for IBM i



3 *Run*
yum install bob
on IBM i

Create a New Project

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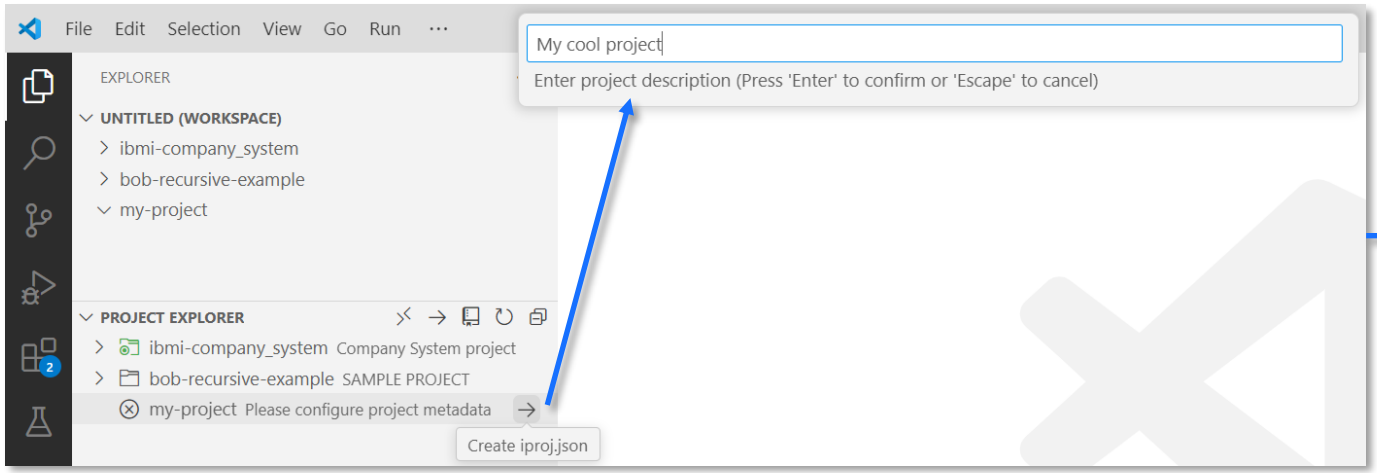
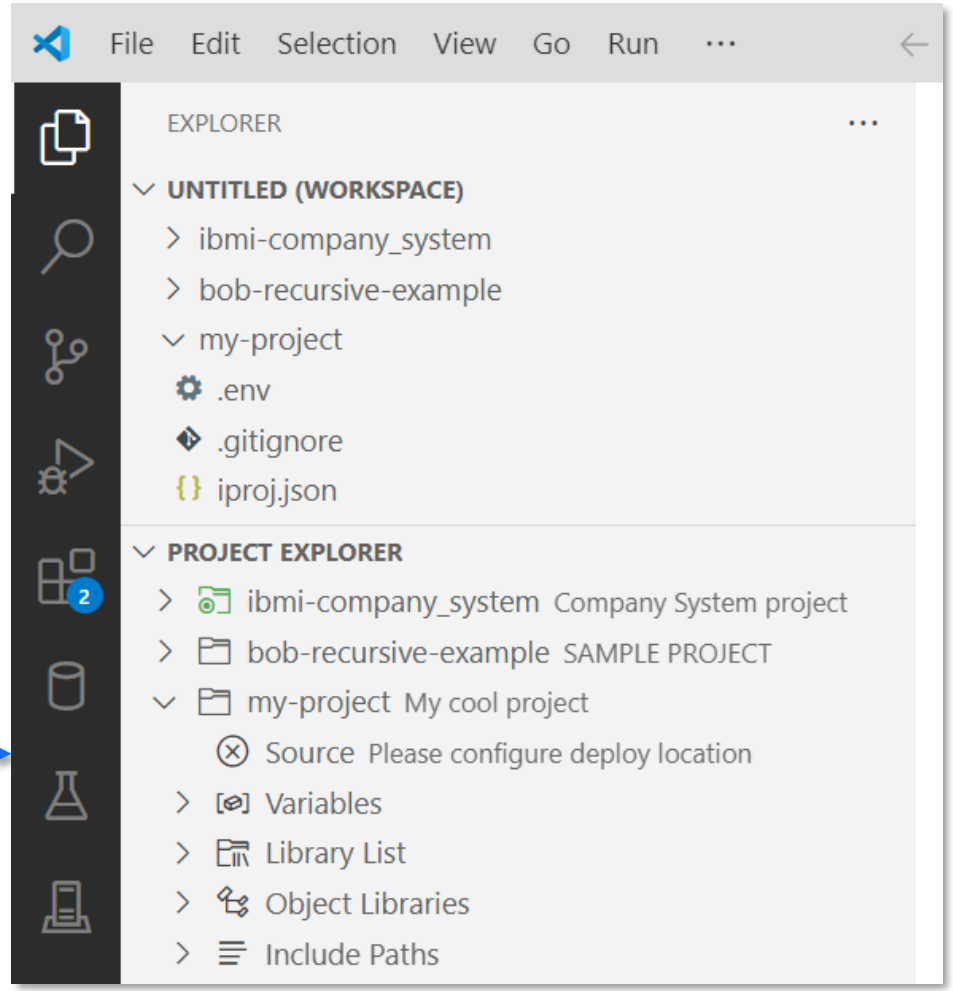
- Create and open a folder for your project
- Create an iproj.json
- Set the project description





Connect to an IBM i

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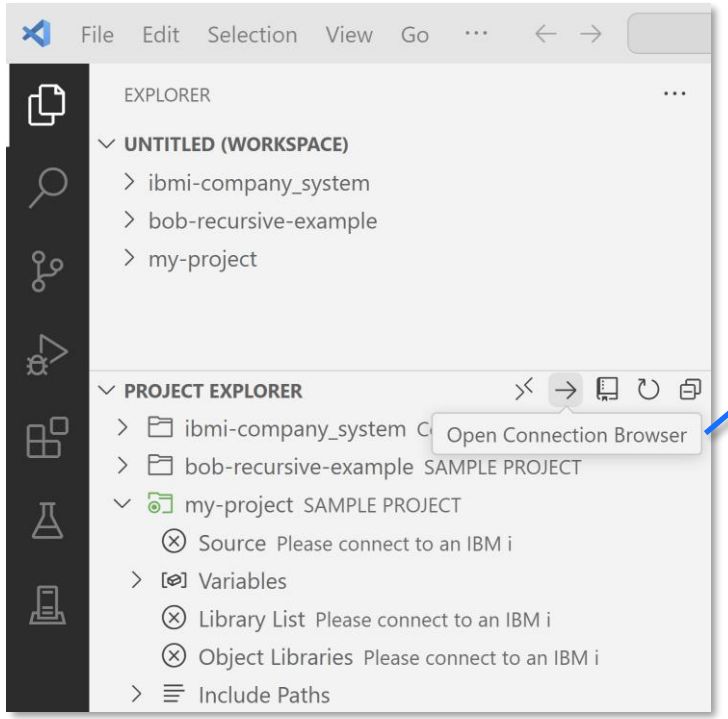
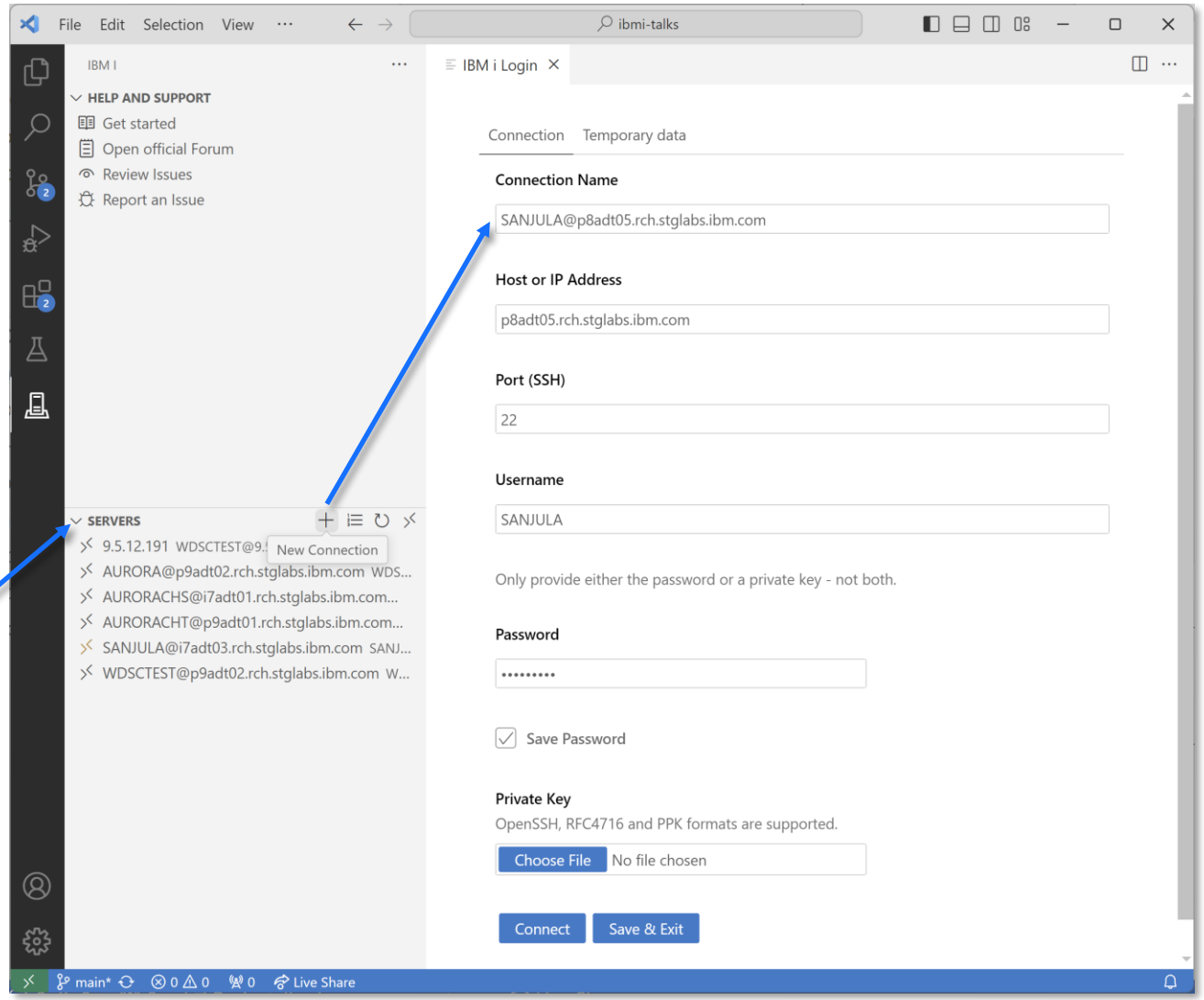
- Open the *Connection Browser* from Project Explorer
- Create new IBM i connection from the *Server* view





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

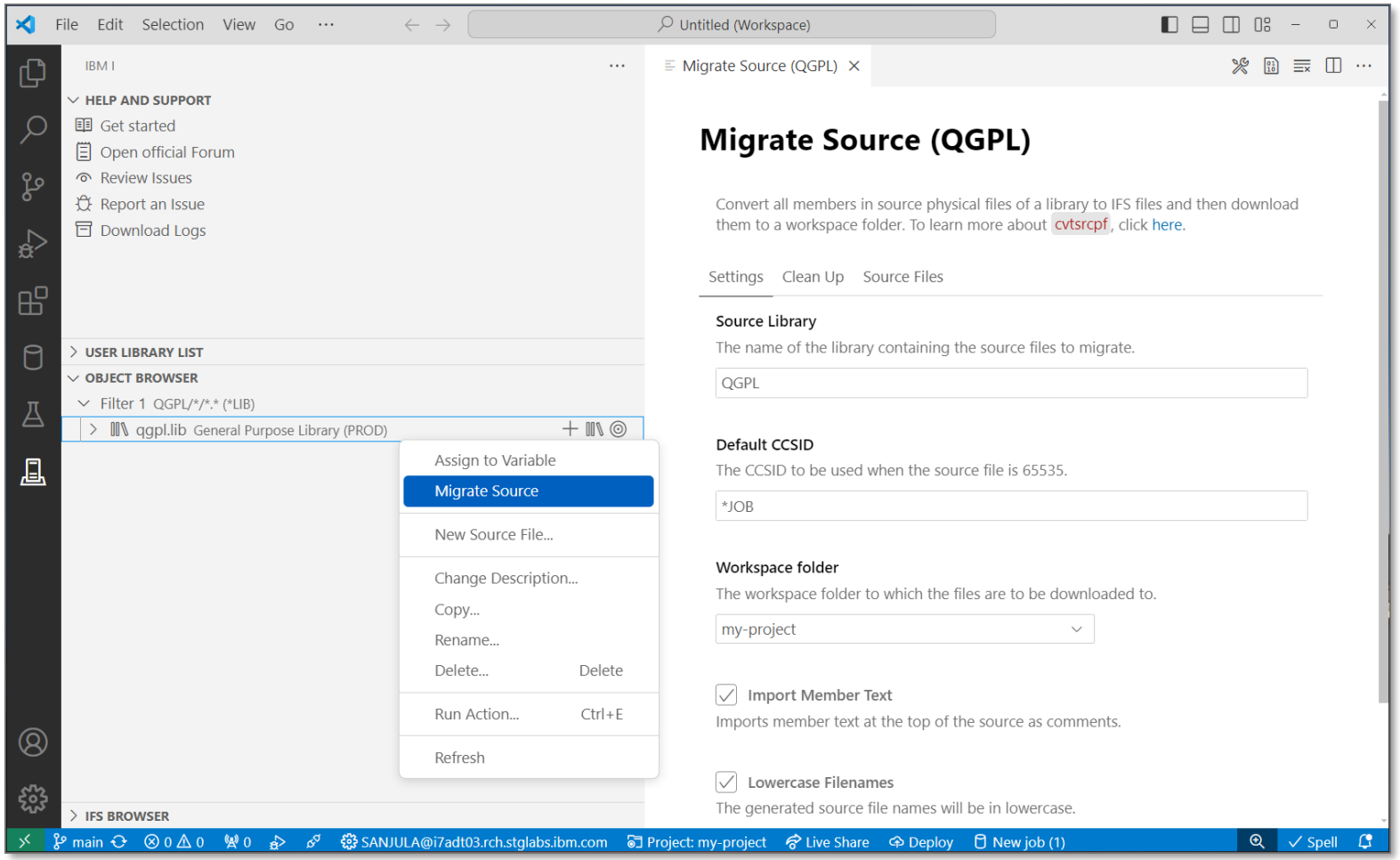
↓

Source Orbit

Rename extensions

↓

Convert includes/copy directives to Unix style paths



Deployment

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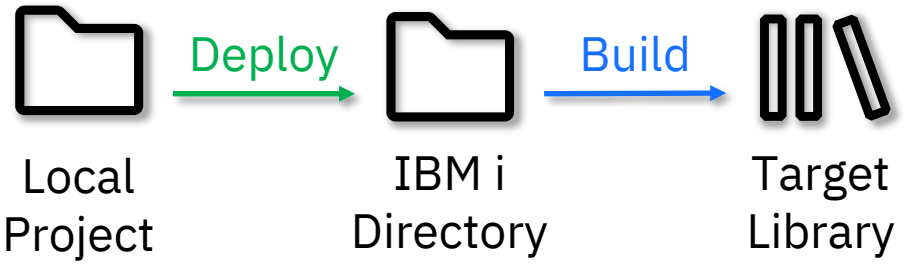
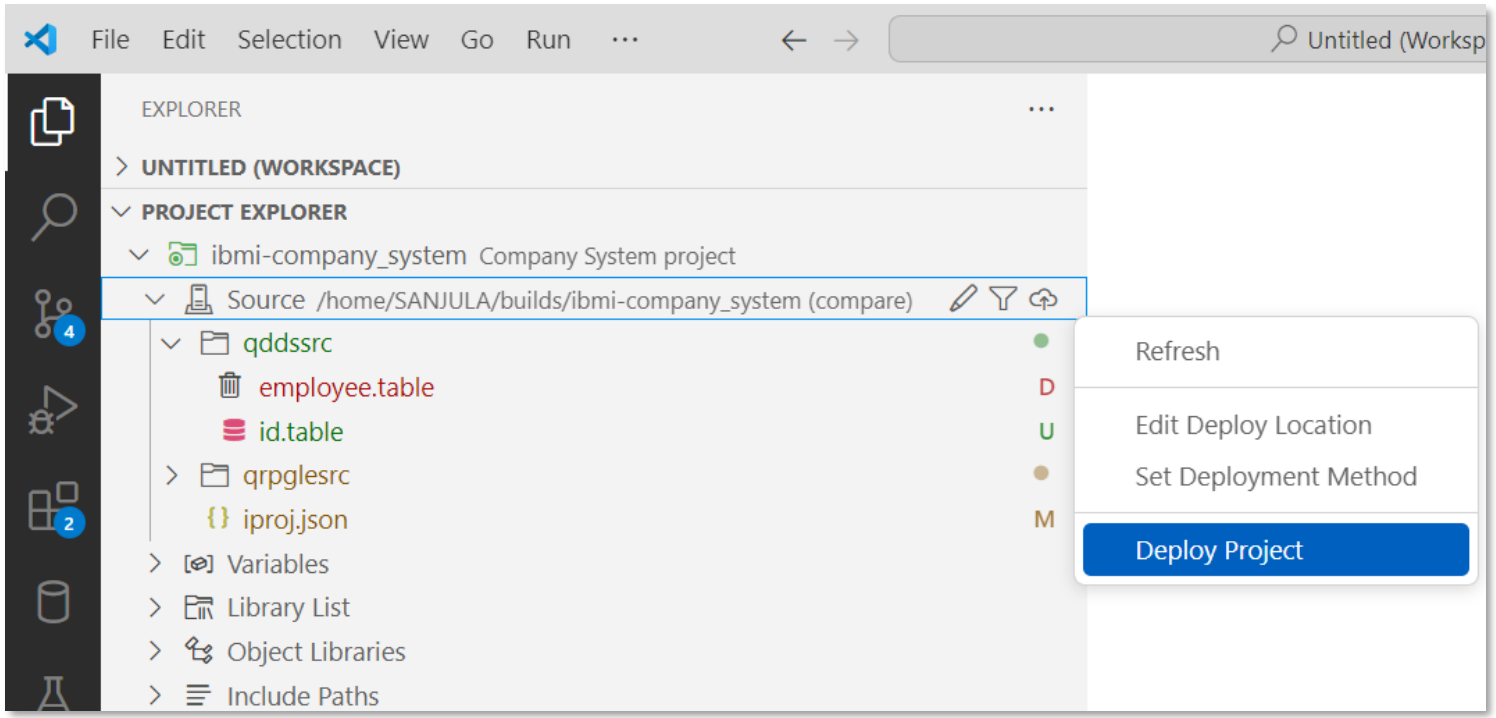
- Set deploy location
  - Where source gets uploaded to
  - Typically set one
  - Each developer gets a unique location
  - Each repository gets a unique location
- Set deployment method
  - Compare (typically the safest)
  - Changes (typically the fastest)
  - Working Changes
  - Staged Changes
  -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





Visualize Local vs. Remote Source Files

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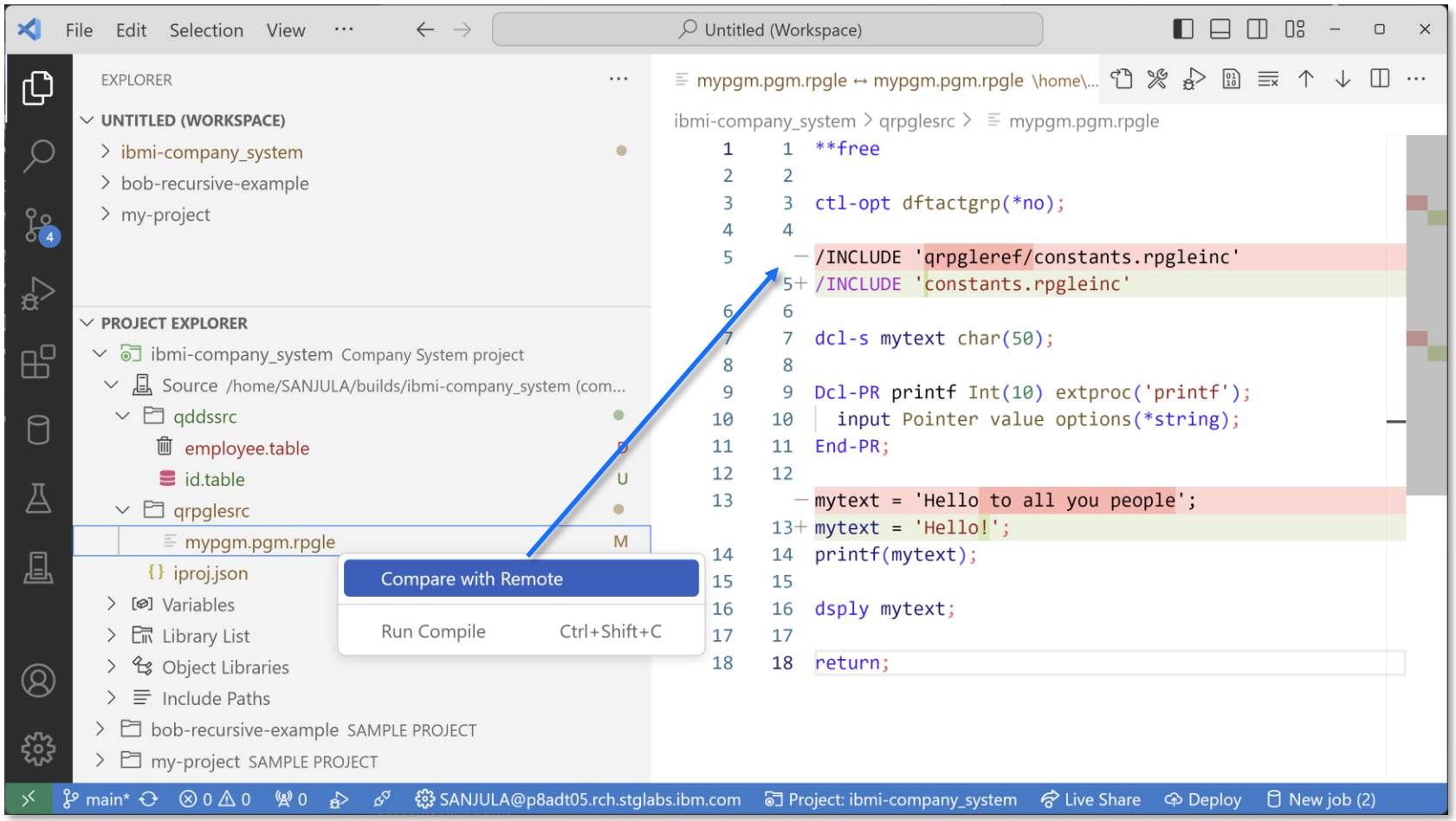
- Visualize, compare, and deploy your local source files to the deploy location in the IFS
- Track file changes (added, modified, deleted, etc.)
- Compare local file content with remote IFS



Work with Variables

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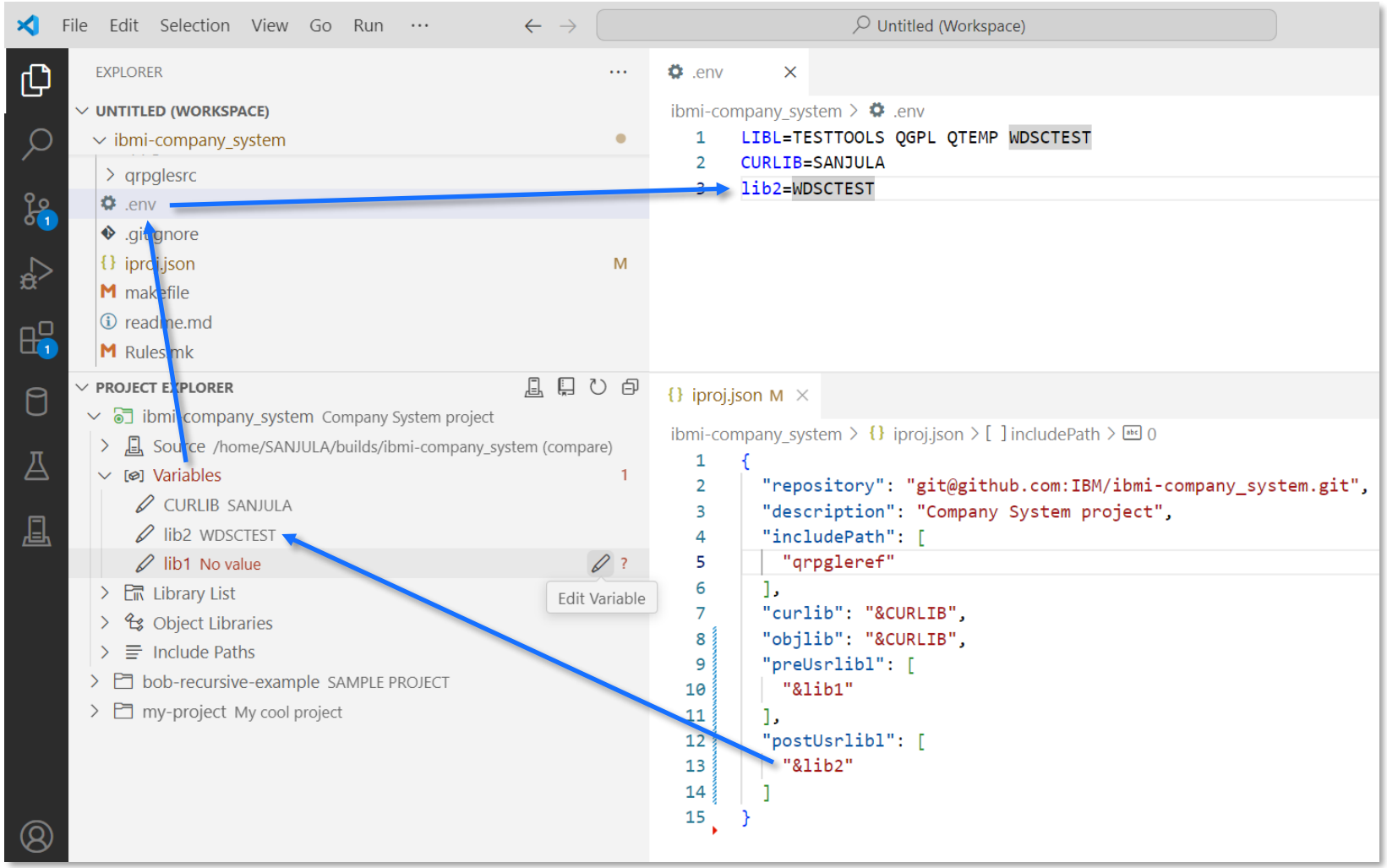
- Reusable project definition that can be used by multiple developers or in automated builds
- View and set variables (for libraries, include paths, or build/compile commands)
- Browse for libraries and assign values to variables
- Configure hardcoded values as variables

Do not push .env file to Git!



Manage the Library List

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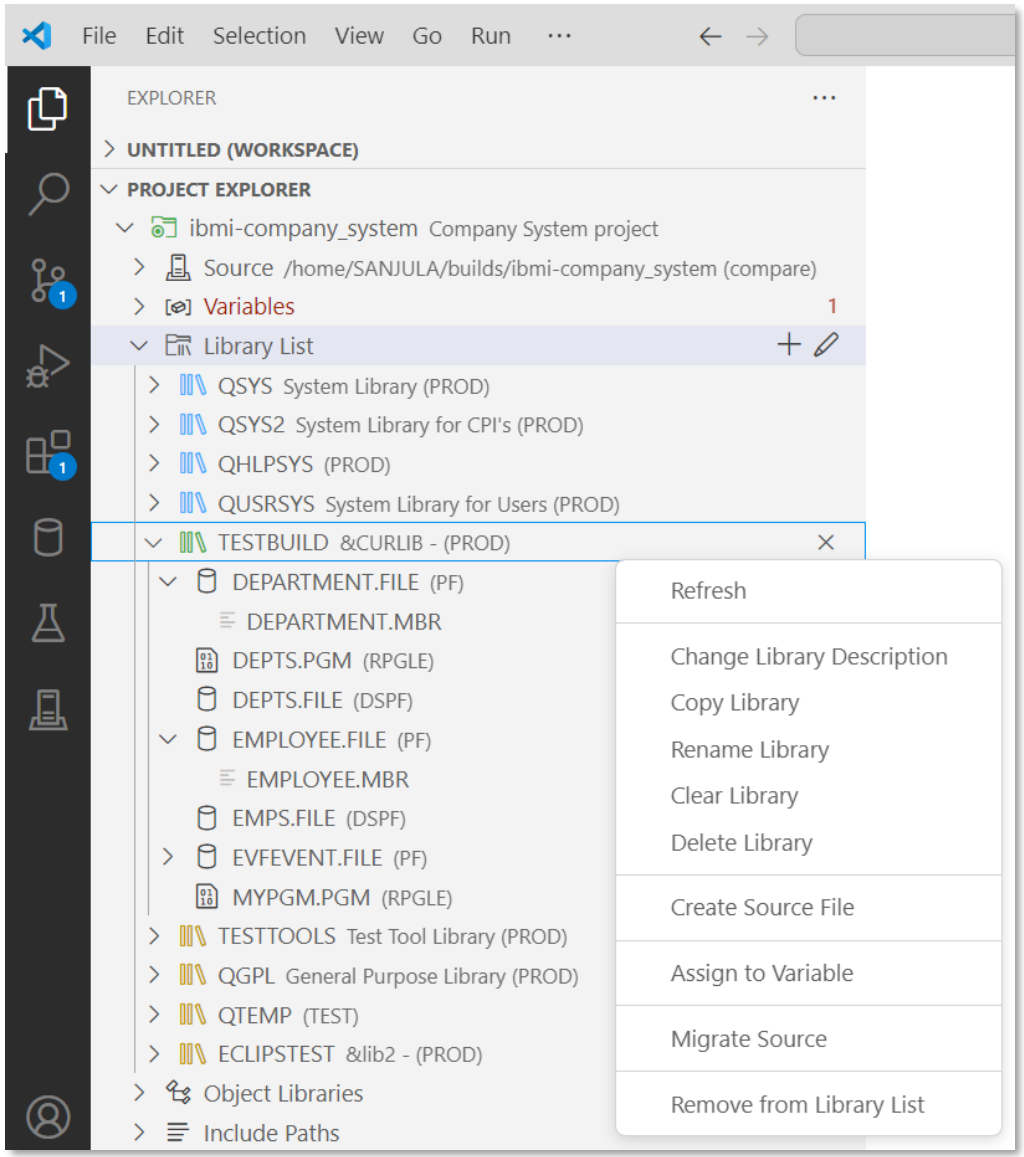
- Project's library list is a composition of your user profile's library list (from JOBD) + set of project specific libraries
- Add to beginning/end of library list (preUsrlibl and postUsrlibl) and set current library (curlib in iproj.json)
- Reorder library list
- Browse objects and members
- Manage libraries, objects, and members



Browse Object Libraries

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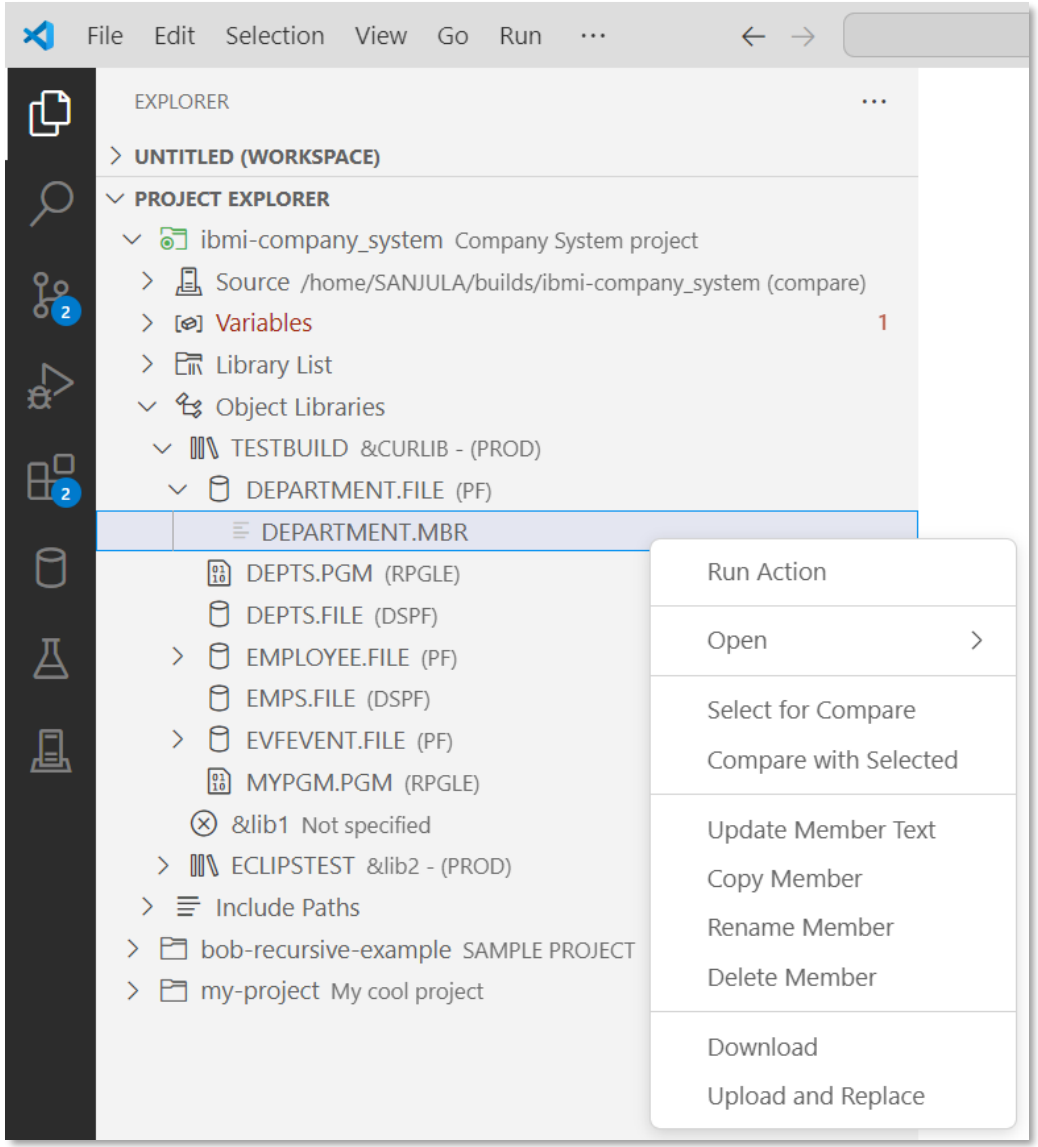
- The place for developers to easily see, debug, and manipulate the results of your build
- Another place to manage libraries in iproj.json (curlib, objlib, preUsrlibl, postUsrLibl)
- Manage libraries, objects, and members



Manage Include Paths

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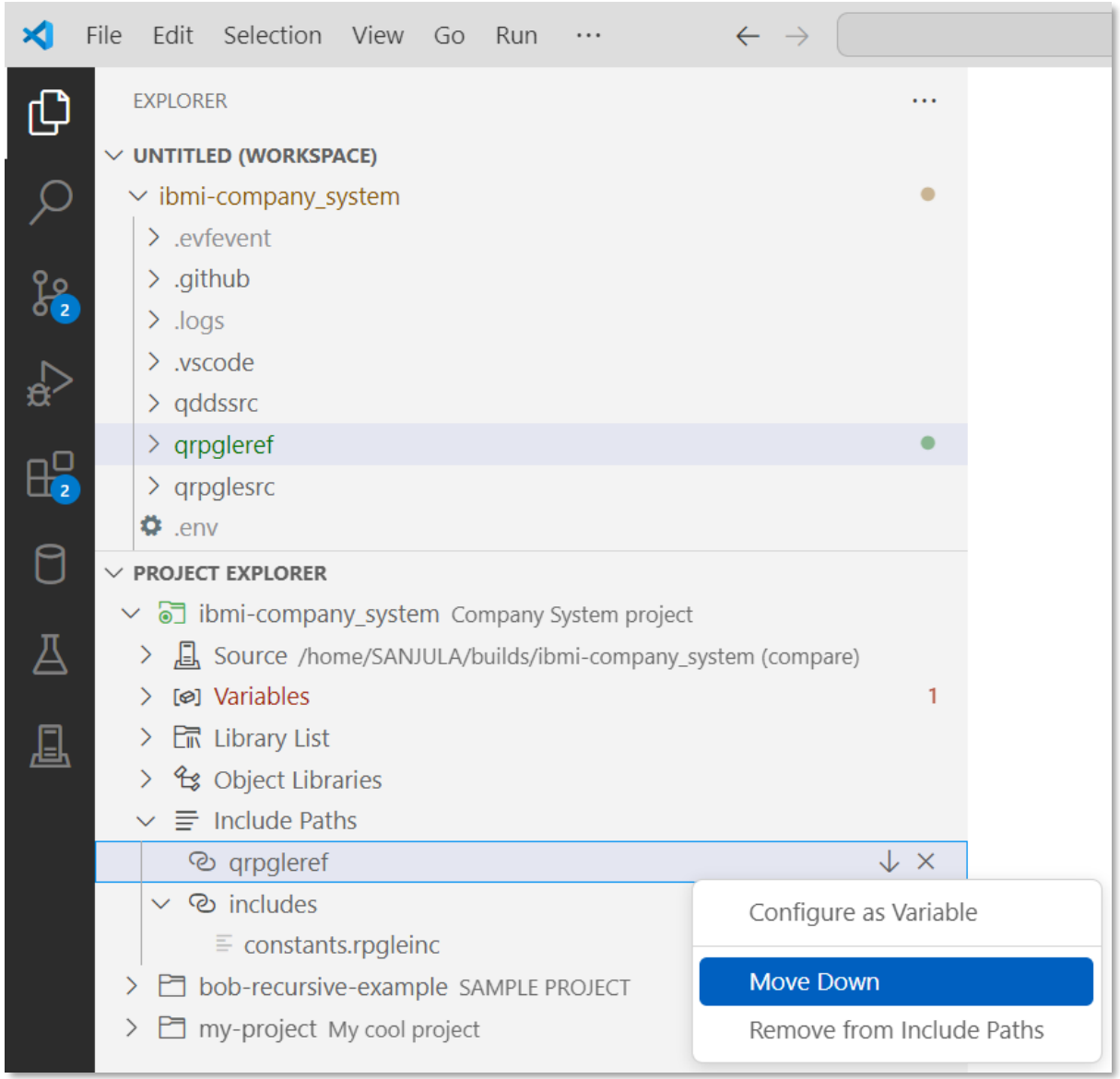
- Self-contained projects should know where to find includes within the project
- Add, remove, and reorder include paths
- Visualize if includes resolve locally or to remote IFS



Build and Compile

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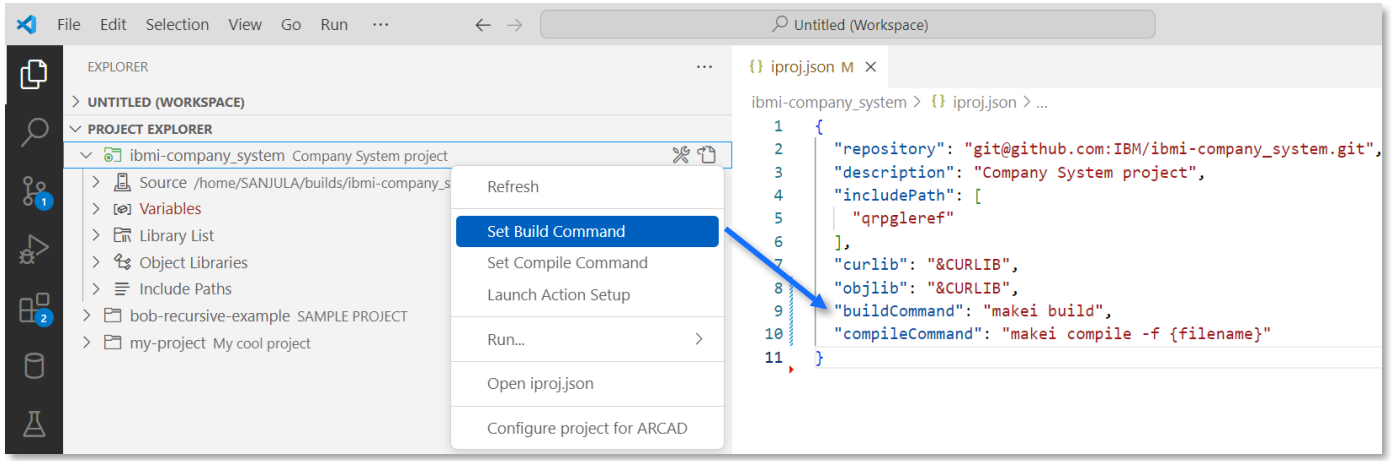
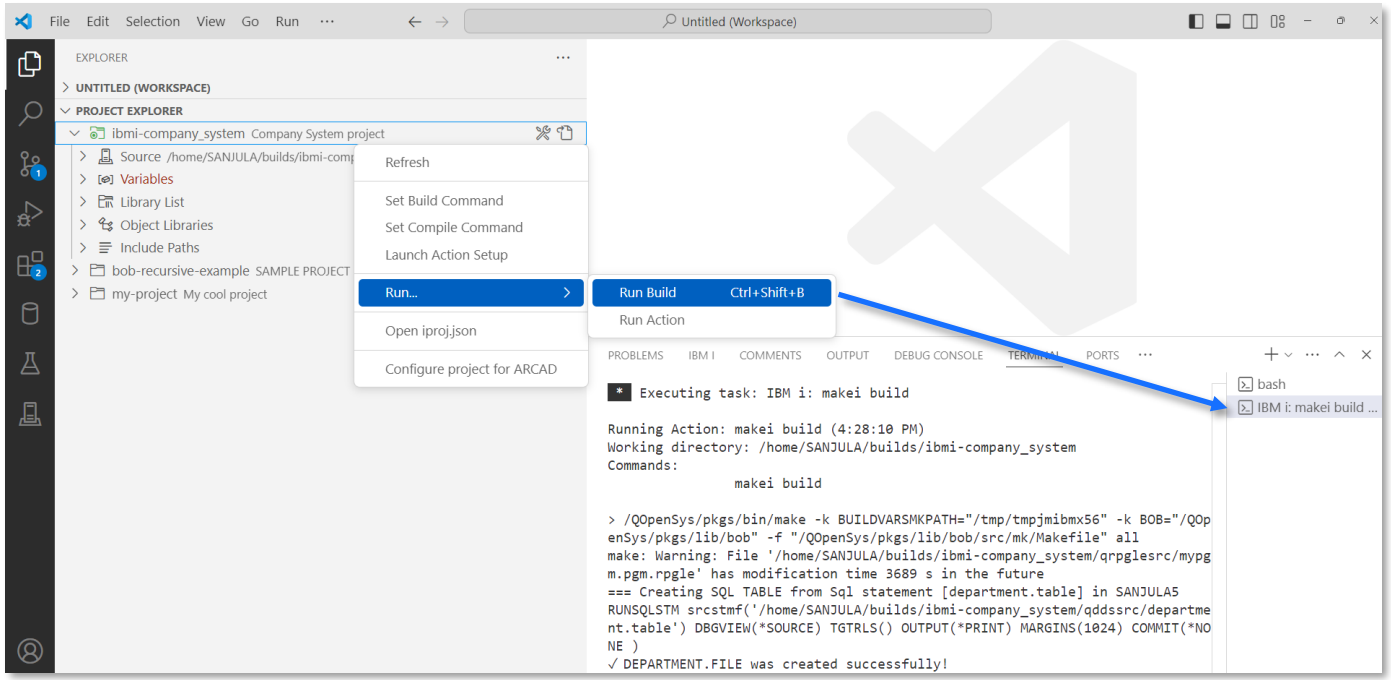
1. Deploy
↓
2. Run build or compile command (any build framework)
↓
3. Download logs and evfevent files





- Building
  - Set build command
  - Run Build (*Ctrl+Shift+b* or *Cmd+Shift+b*)
- Compiling
  - Set compile command
  - Run compile (*Ctrl+Shift+c* or *Cmd+Shift+c*)
    - On active editor
    - On file or directory in File Explorer
    - On file or directory in Source

Run Actions

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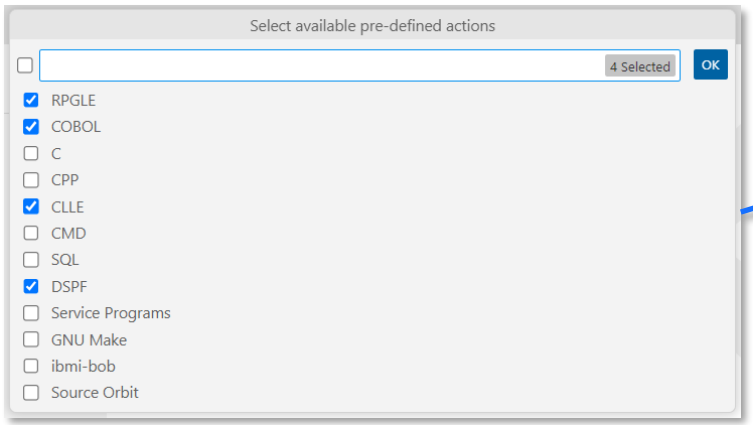
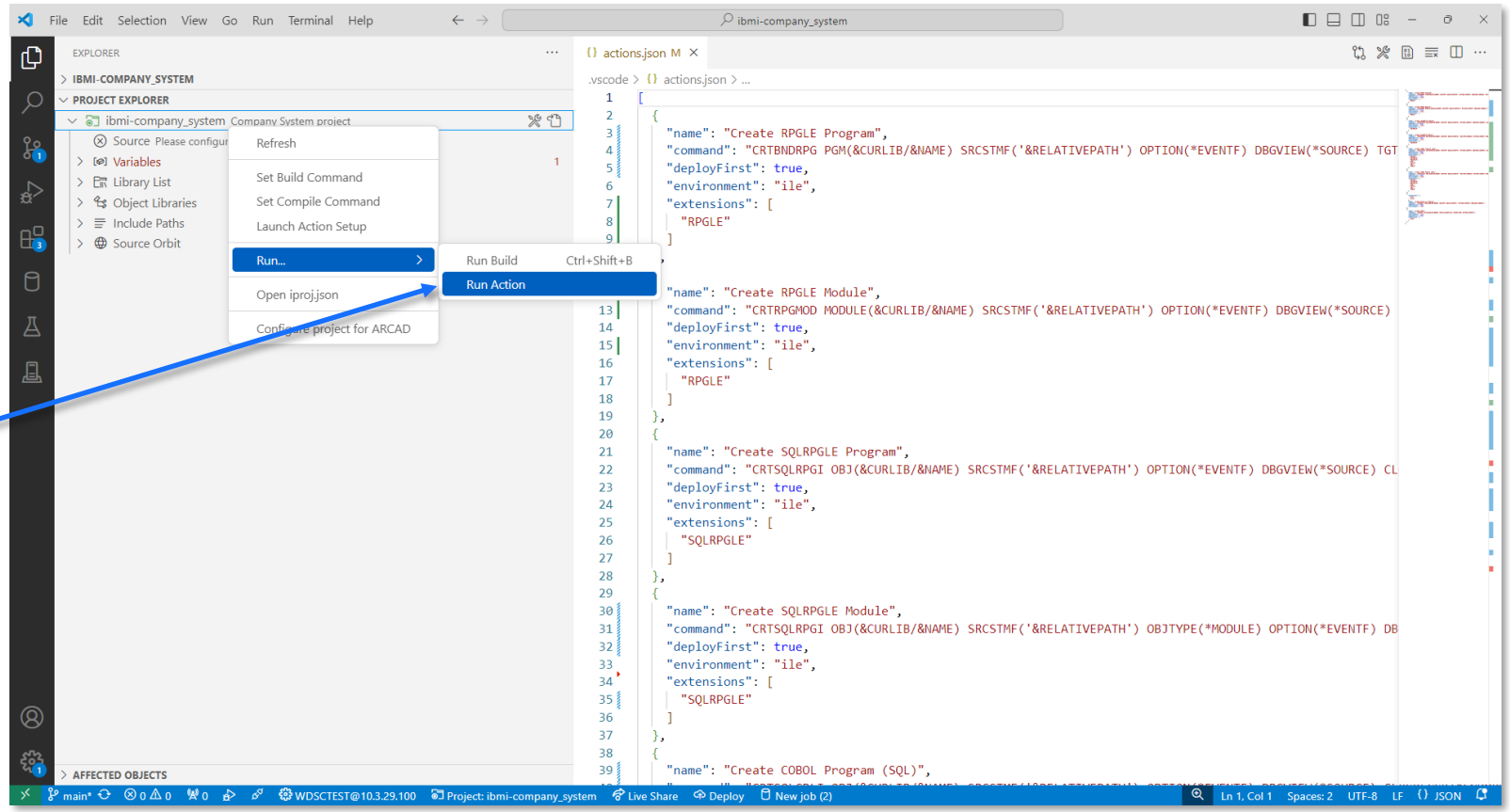
IBM i Project Explorer also supports running Code for IBM i's custom workspace actions





View Diagnostics

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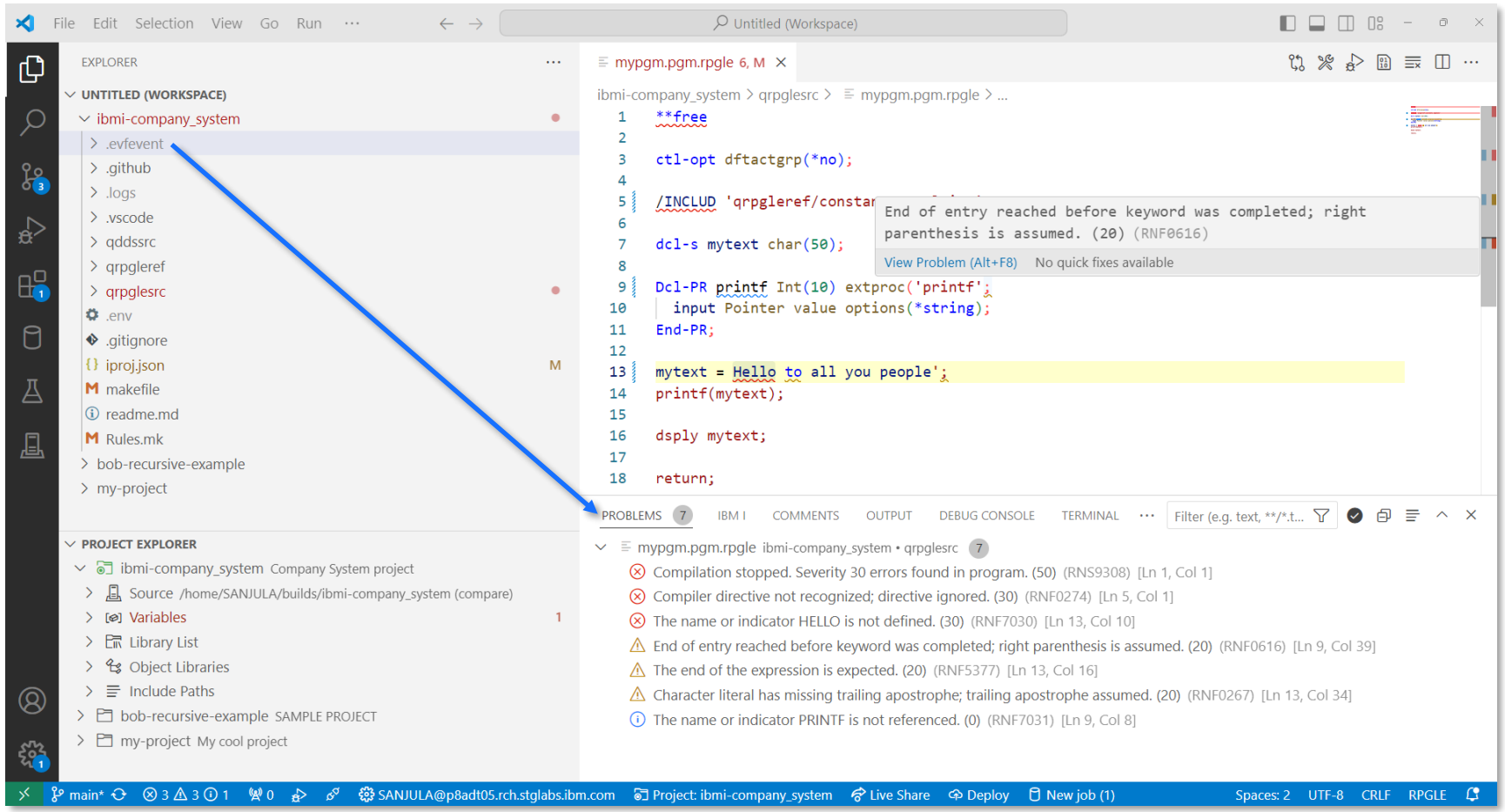
- Visualize build or compile diagnostics in the Problems view
- Evfevent file diagnostics are dumped in a .evfevent directory after a build or compile
- Diagnostics are also rendered inline in the source file



View Job Logs

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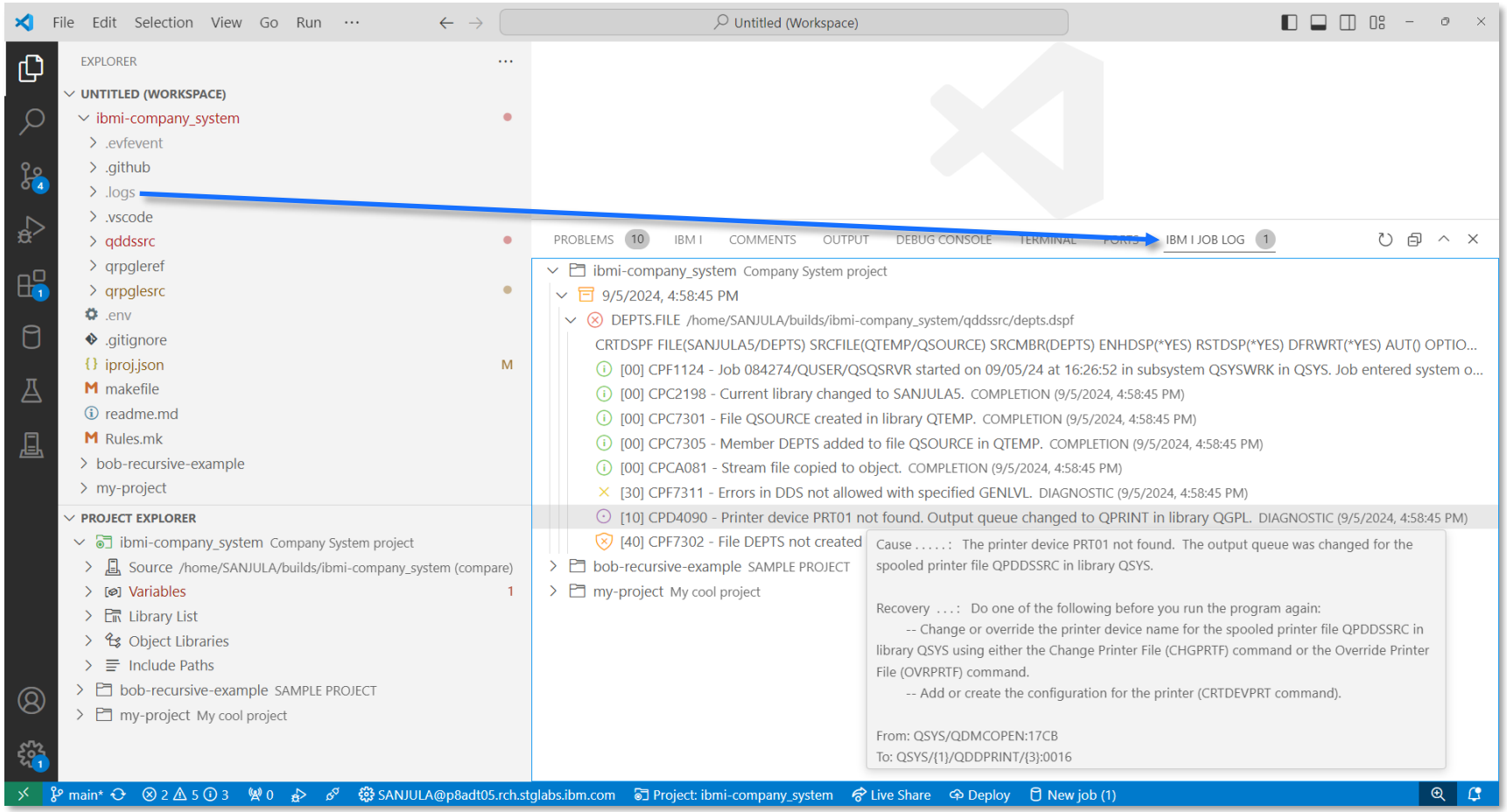
- Visualize and manage anything that could be seen in an IBM i job log including second level help
- Job log and spool files are dumped in .logs directory after a build or compile
- Track up to 10 of the previous logs in memory
- Organized by the ILE objects being built
- Filter by failed objects or severity



Integration

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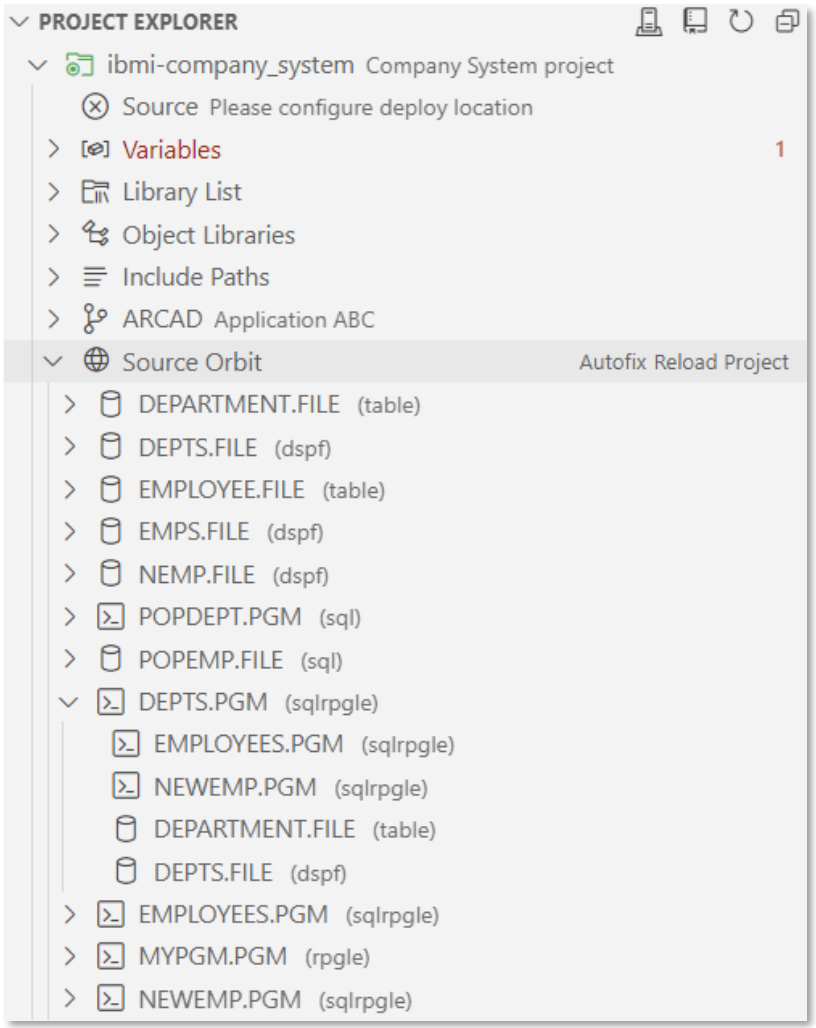
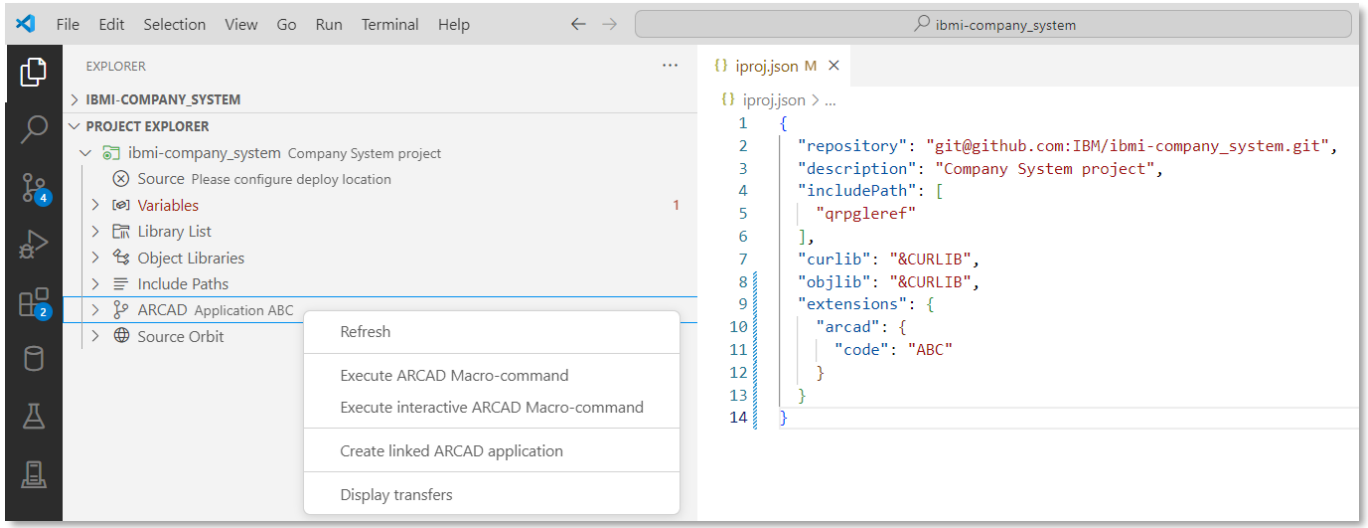
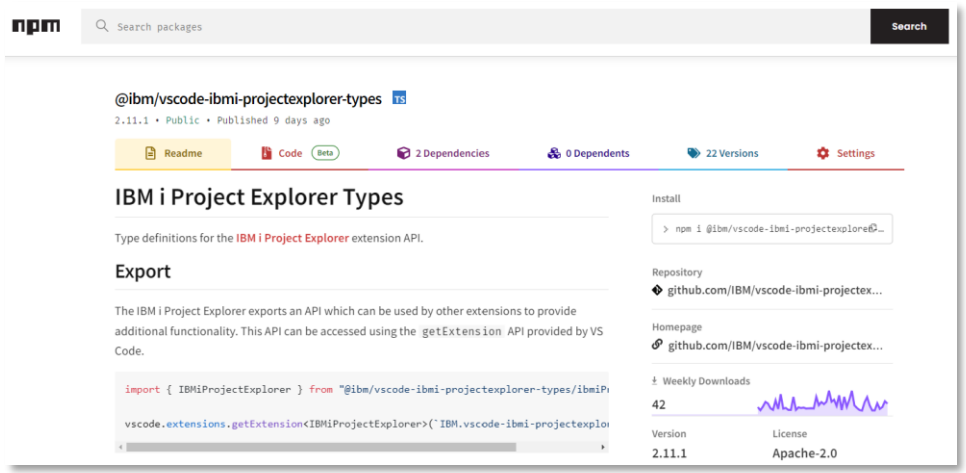
Source Orbit



ARCAD-Elias



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