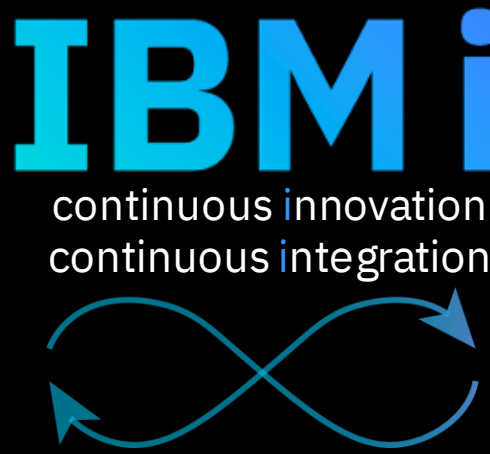
Automating Builds
in Git on IBM i



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✨ Special thank you to Liam Allan for slide content!

Agenda

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- The Modern Development Lifecycle with Git
- Unlock Automated Builds with ibmi-ci
- ILE Dependency Analysis with Source Orbit
- Use Cases
- Demo

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The Modern Development Lifecycle with Git

What Does Modern Development Look Like?

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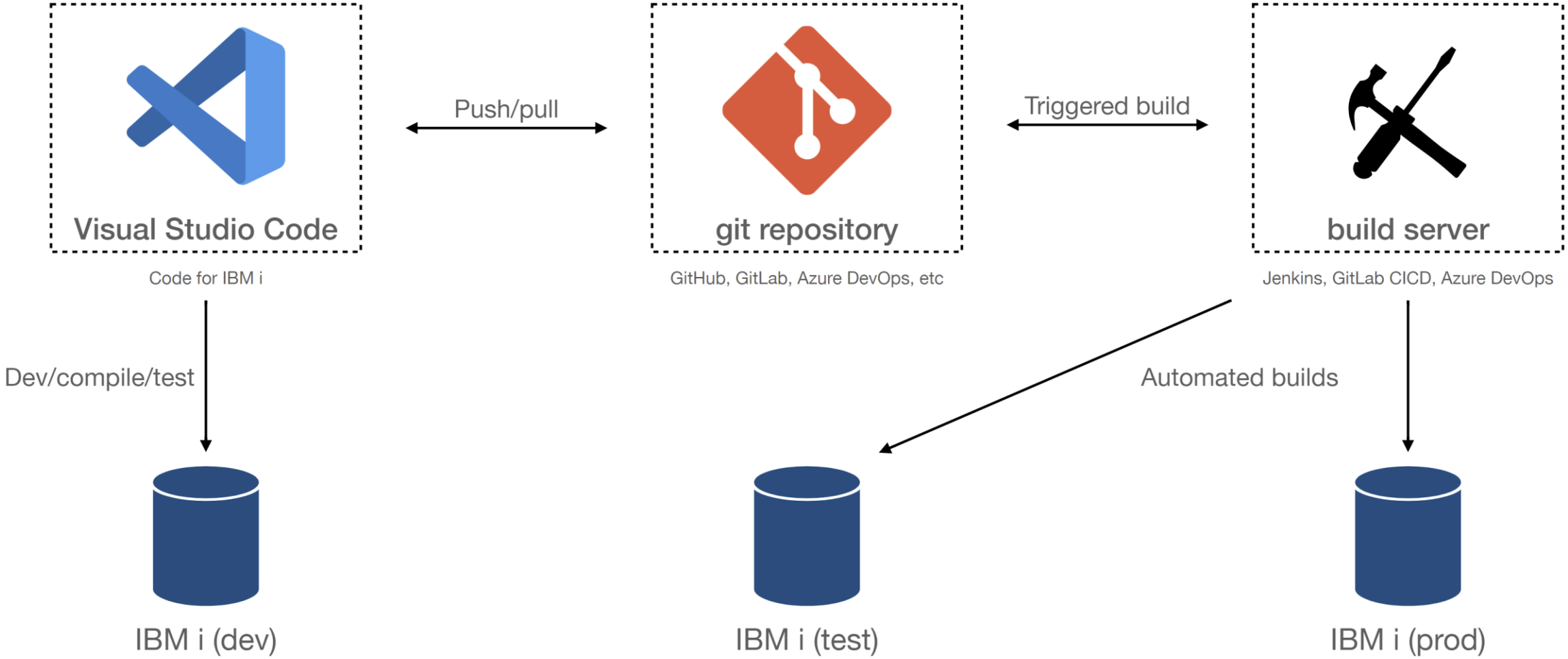

Development with Git

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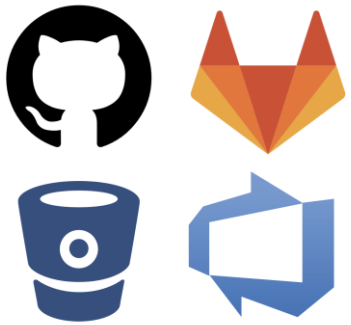
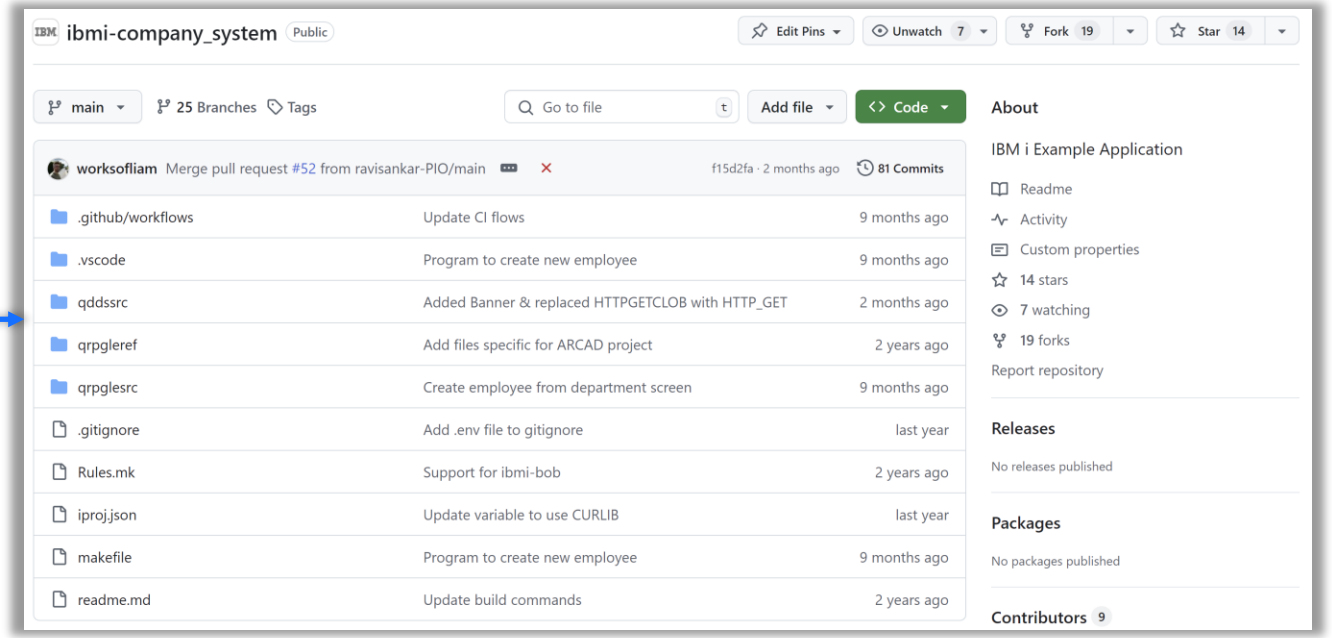
- Source is managed by Git
  - Complete change history
  - Branching and merging capabilities
  - Traceability

GitHub, GitLab, Azure DevOps, etc

- Variety of options for Git hosting services
  - GitHub, GitLab, Azure DevOps, etc





Why use Git?

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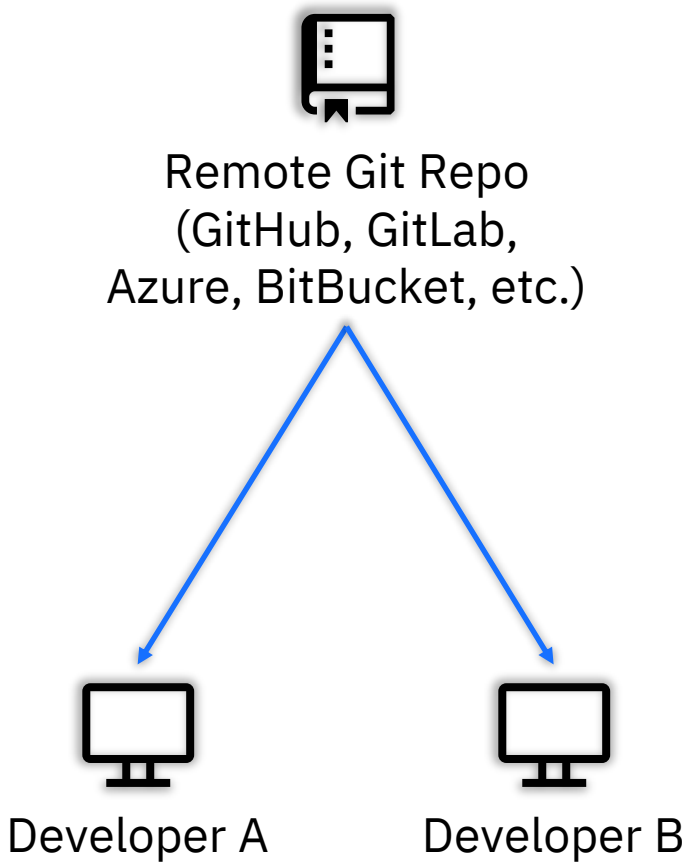
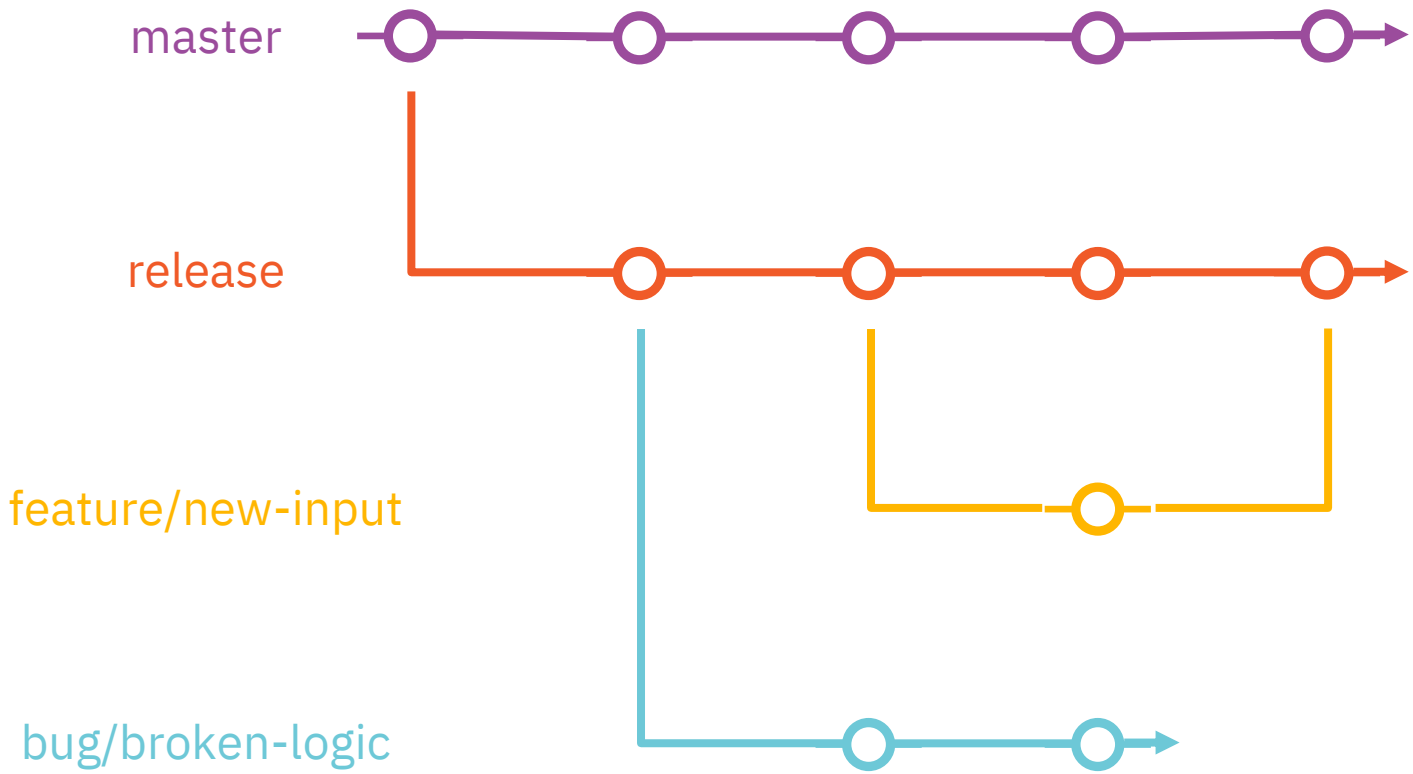
Distributed Development



Version Control and Git Workflow



Local Development Experience

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- IBM i
  - IBM i integration via open-source extensions
  - Support for RPGLE, COBOL, CL, SQL, and more!
- Git
  - First class Git support
  - Hundreds of Git tools

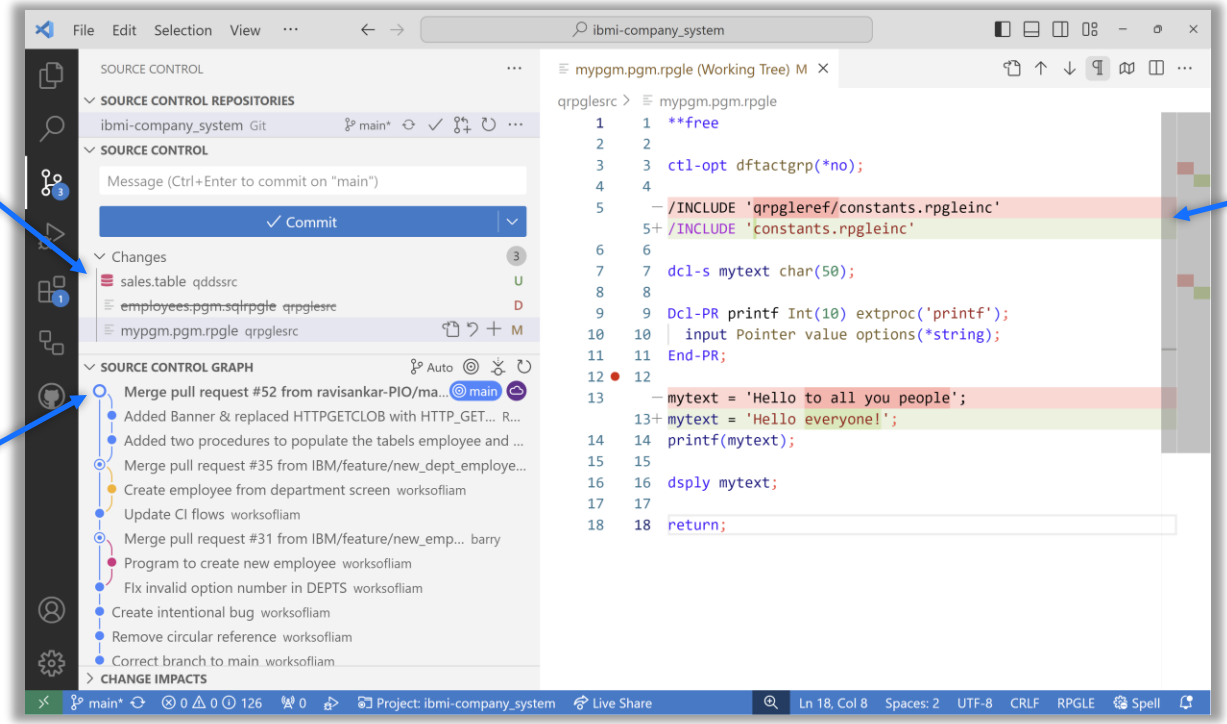
Visual Studio Code

Code for IBM i

View current repository changes

View a graphical representation of incoming and outgoing commits

View changes line by line



How to work efficiently with these 3 components?

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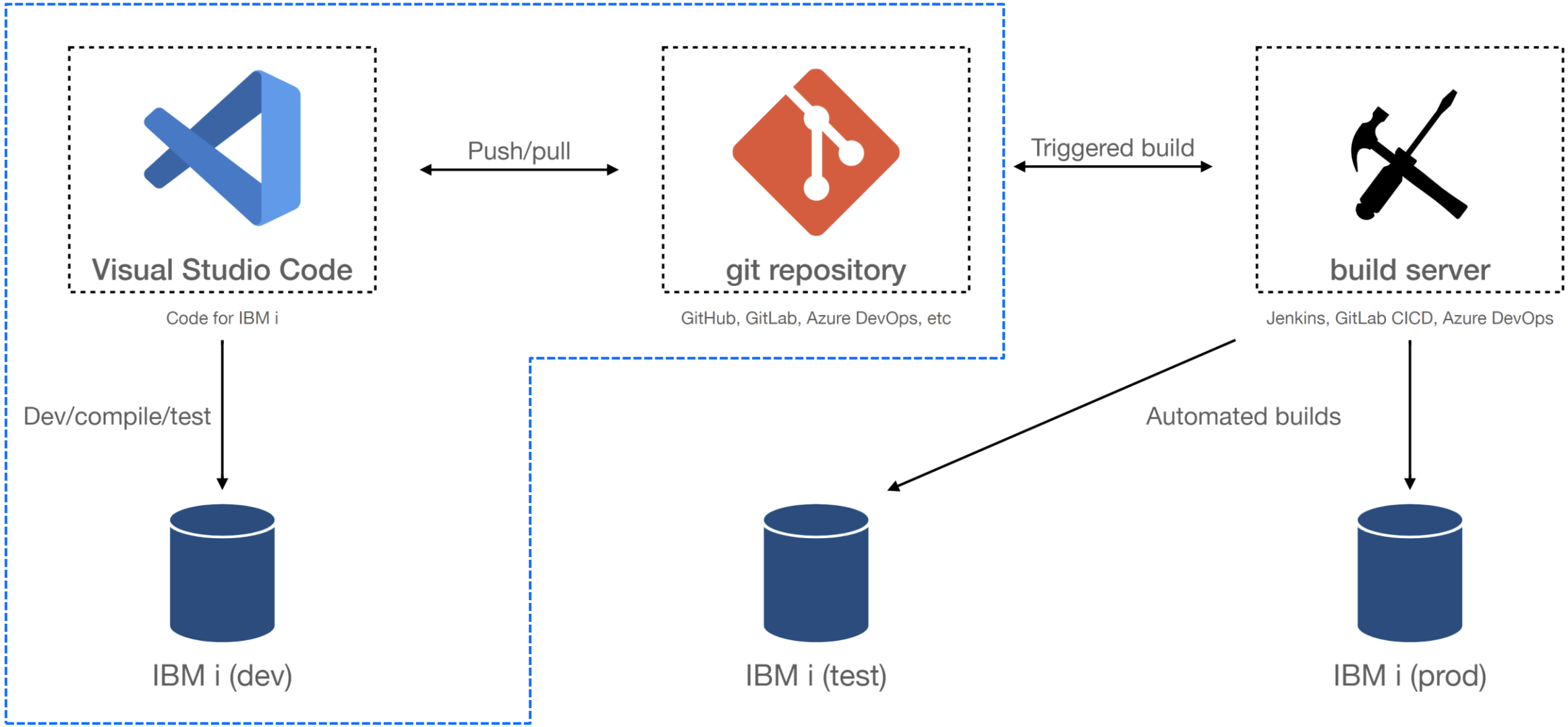

Map Git branches to libraries on IBM i

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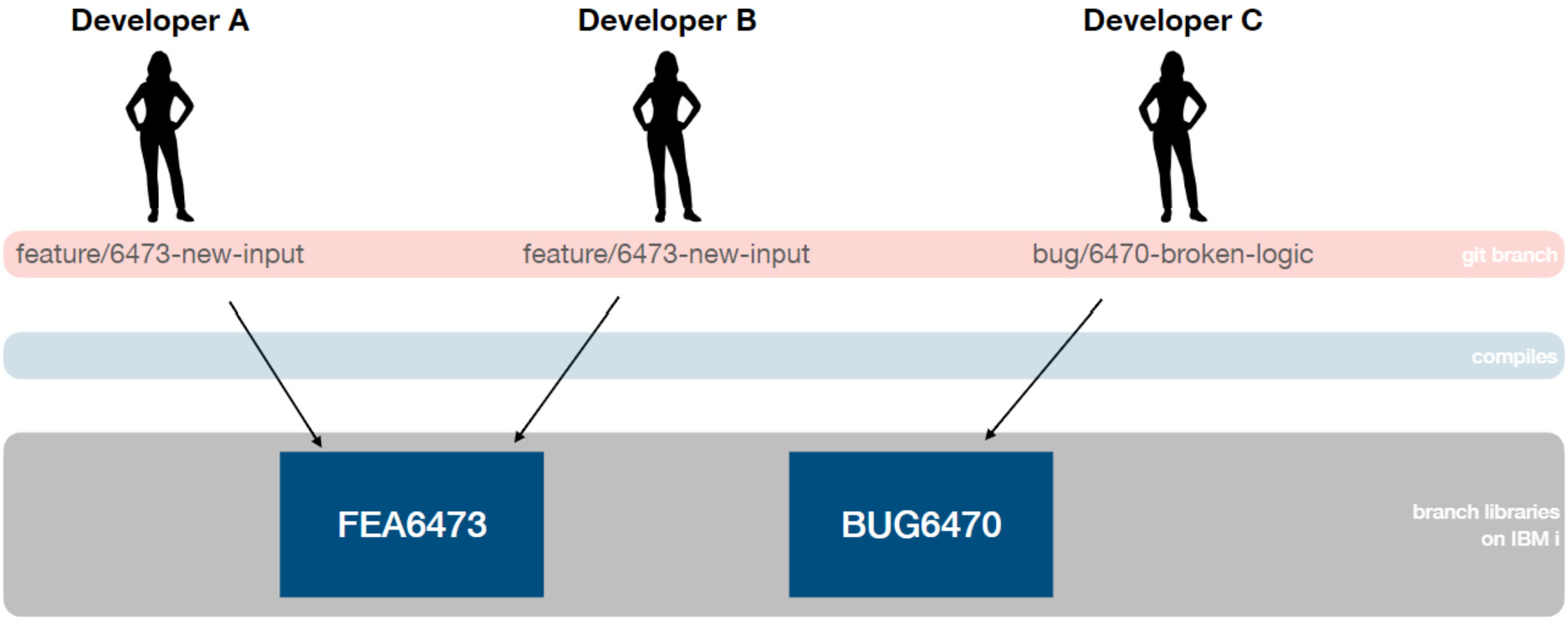

Build Server

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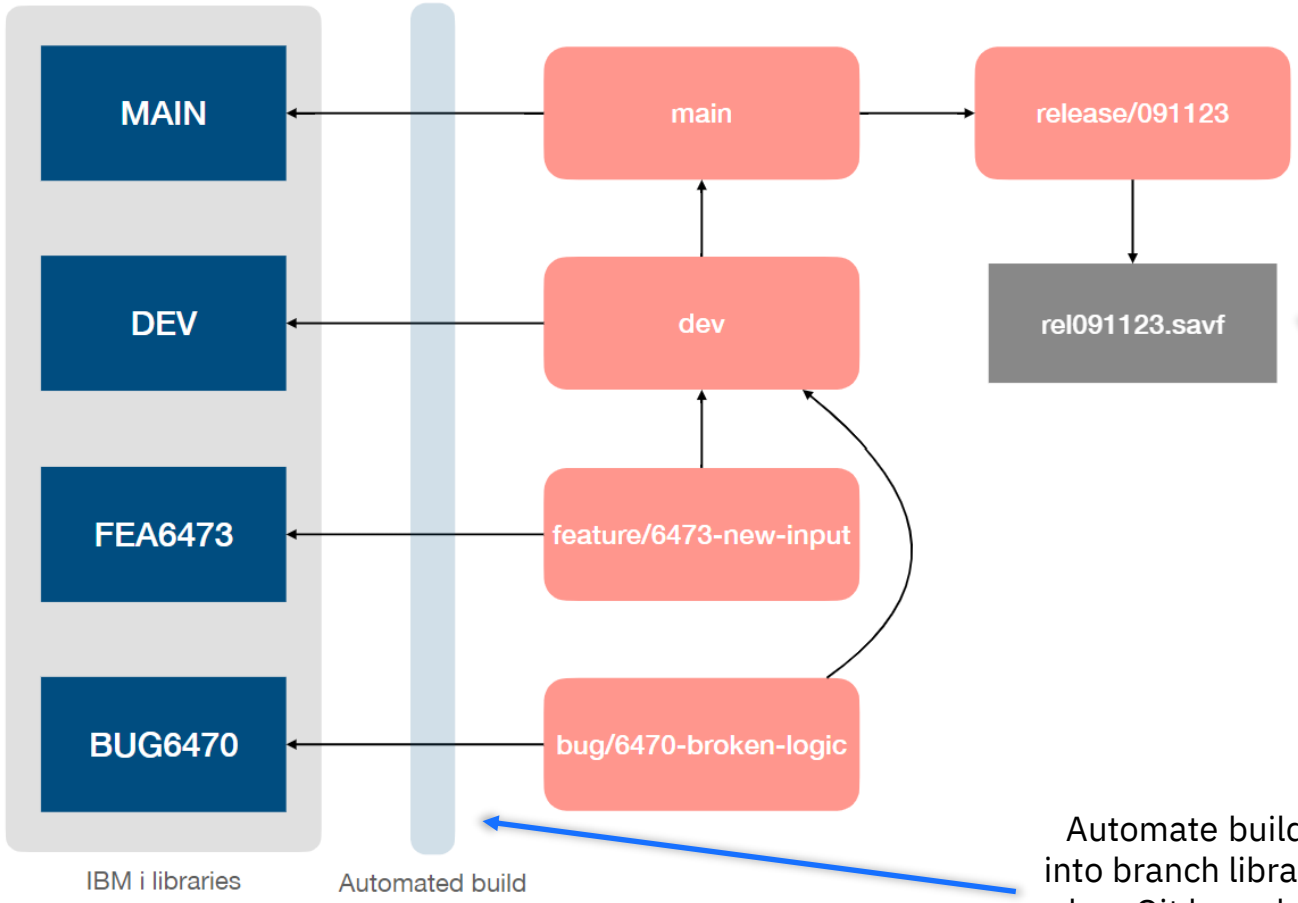
Let's go one step further and automate this process



Jenkins, GitLab CICD, Azure DevOps

Generate save files when releases are created

Automate build into branch library when Git branch is updated

How to create workflows?

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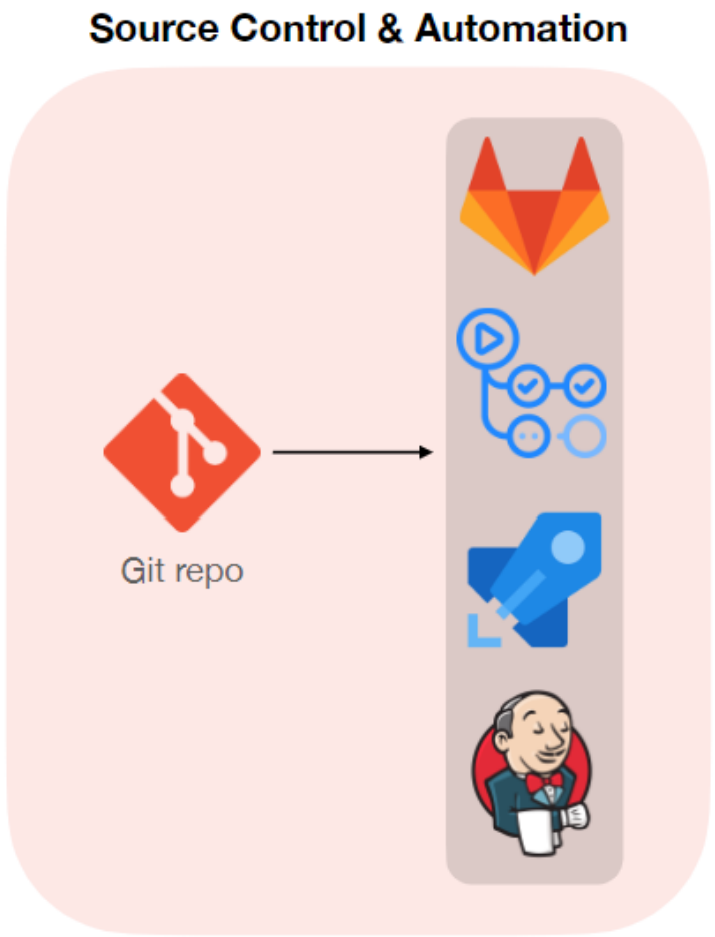

GitLab	`.gitlab-ci.yml`
Azure DevOps	`azure-pipeline.yml`
GitHub	`anything.yml`
Jenkins	`Jenkinsfile`

yml can also be yaml

How to achieve automation with IBM i?

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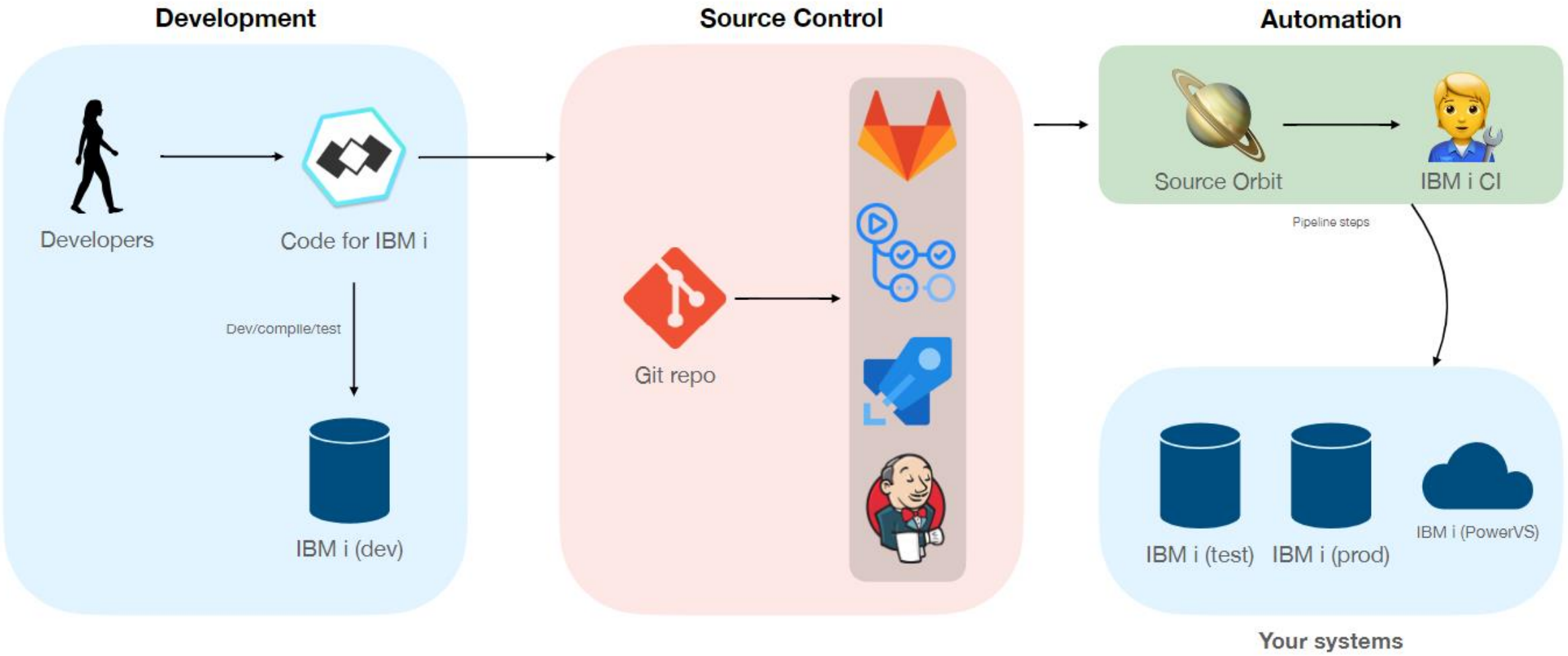

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Unlock Automated Builds with ibmi-ci

Overview

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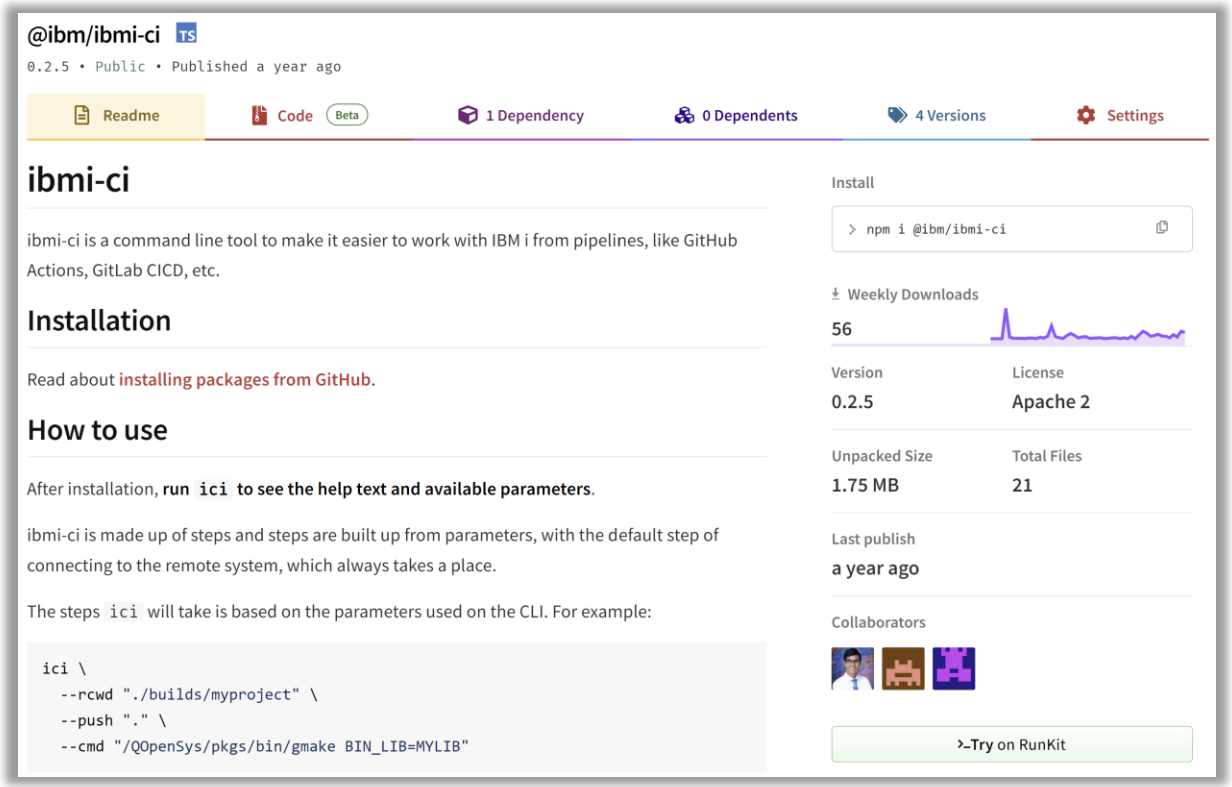
- A CLI tool to simplify working with IBM i from pipelines (ex. GitHub Actions, GitLab CICD, etc.)

- Outline a series of steps to perform with the first default step being to connect to an IBM i

- Installation: npm i @ibm/ibmi-ci

- Establishing IBM i connection
  - Required
    - IBMI_HOST
    - IBMI_SSH_POST
    - IBMI_USER
  - At least one required
    - IBMI_PASSWORD
    - IBMI_PRIVATE_KEY



CLI Usage

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--lcwd <localDirectory>	Sets the current working directory on the local system
--rcwd <remoteDirectory>	Sets the current working directory on the remote system. It will be created if it does not exist.
--push <remoteRelativeDirectory>	Pushes the current working directory to a chosen directory on the IBM i
--pull <remoteRelativeDirectory>	Pulls a directory from IBM i to the local current working directory
--get <remoteRelativeDirectory> <localRelativePath>	Gets a specific file from IBM i
--cmd <shellCommand>	Execute a command on the remote system
--cl <clCommand>	Execute a CL command on the remote system

Simplistic Example

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```
ici \
  --rcwd "./builds/myproject" \
  --push "." \
  --ignore --cl "CRTLIB LIB(MYLIB)"
  --cmd "/QOpenSys/pkgs/bin/gmake BIN_LIB=MYLIB"
```

Upload the local working directory to the remote working directory (.)

Build project with gmake

Suppress errors and continue execution

Set the remote working directory to ./builds/myproject

Create build library if it does not exist

⭐IBM i connection is specified as environment variables

GitHub Action Example

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```yaml
jobs:
  ibmi-build:
    environment: COMMON1
    runs-on: ubuntu-latest
    steps:
      # Checkout repository and setup node steps omitted

      - name: Install Dependencies
        run: npm i -g @ibm/sourceorbit

      - name: Deploy to IBM i
        run: |
          ici \
            --cmd "mkdir -p './builds/ics_${GITHUB_HEAD_REF}'" \
            --rcwd "./builds/ics_${GITHUB_HEAD_REF}" \
            --push "." \
            --cmd "/QOpenSys/pkgs/bin/gmake BIN_LIB=CMPSYS"
        env:
          IBMI_HOST: ${{ secrets.IBMI_HOST }}
          IBMI_USER: ${{ secrets.IBMI_USER }}
          IBMI_PASSWORD: ${{ secrets.IBMI_PASSWORD }}
          IBMI_SSH_PORT: ${{ secrets.IBMI_SSH_PORT }}
```

GITHUB_HEAD_REF is the head ref or source branch of the pull request

IBM i connection is specified as environment variables

Why use environments?

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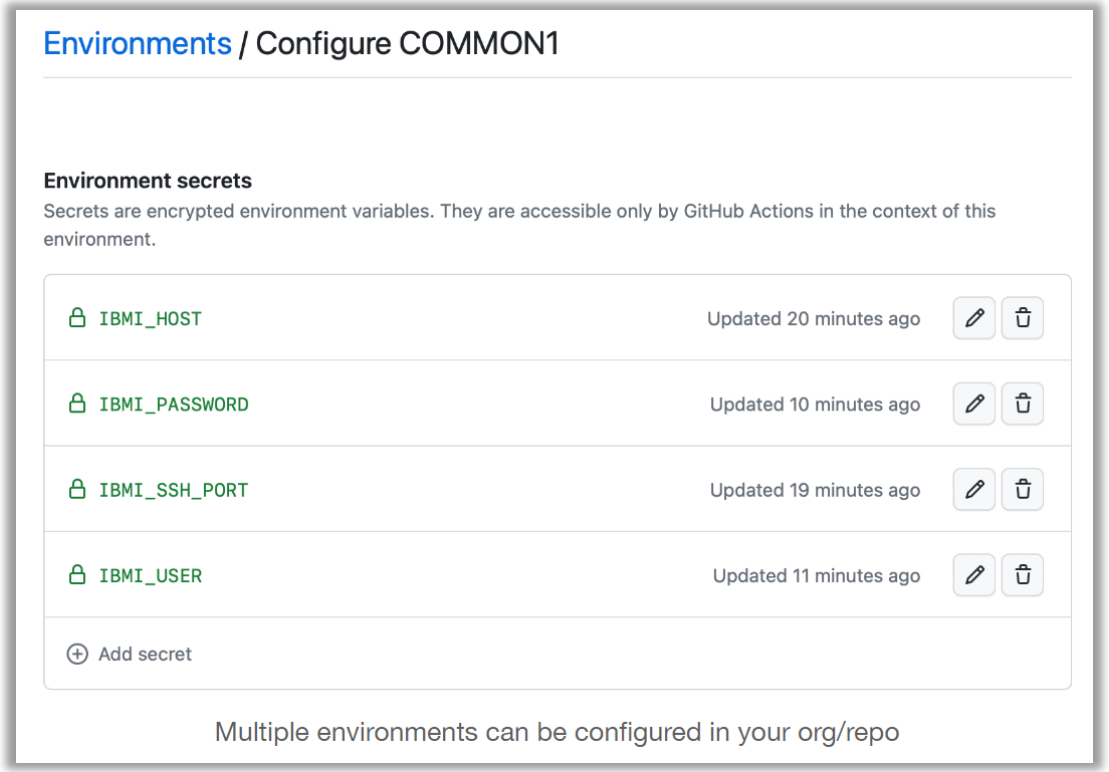

Use a matrix to run a workflow on multiple IBM i machines

```yaml
jobs:
  ibmi-build:
    strategy:
      matrix:
        environment: [COMMON1, OSSBUILD]
    environment: ${{ matrix.environment }}
    runs-on: ubuntu-latest
```

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ILE Dependency Analysis with Source Orbit

Overview

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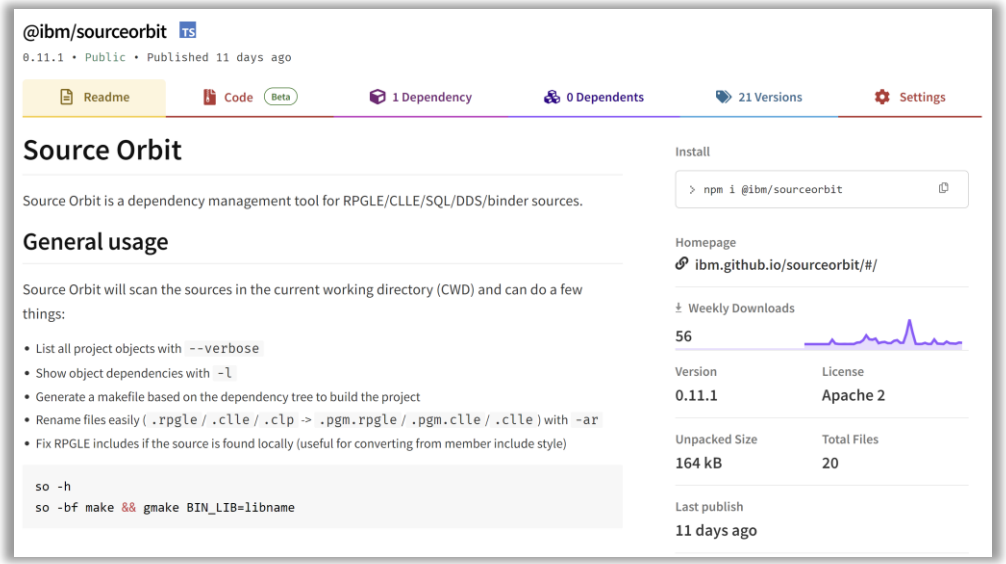
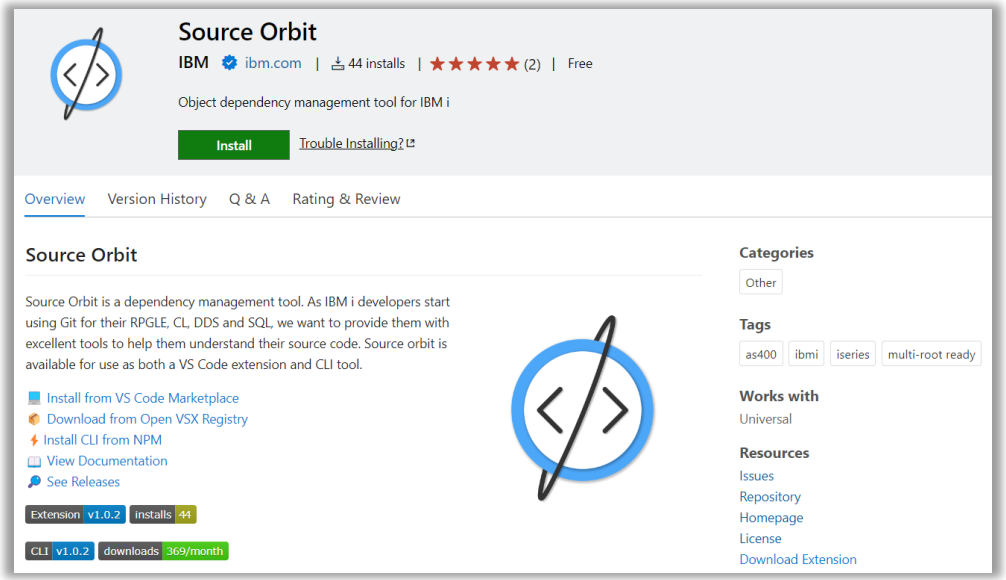
- A dependency management tool (CLI and VS Code extension!)
  - Build dependency tree for RPGLE, DDS, SQL, CL, etc.
  - Generates impact analysis information
  - Generate scripts to automate builds
  - Clean up your project
- CLI Installation
  - npm i @ibm/sourceorbit
- Extension Installation
  - https://marketplace.visualstudio.com/items?itemName=IBM.vscode-sourceorbit





CLI Usage

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- so –ar
  - Scan all source code and fix extensions
    - Rename programs to have *.pgm.*
    - Rename include files to use *.rpgleinc*
    - Rename SQL source to use extension based on *CREATE* statement

- so –fi
  - Fix include/directory directives to use UNIX style paths if found in local source

- so -bf <type>
  - make: Generate single makefile with targets and rules
  - bob: Generate Rules.mk files for Bob
  - imd: Generate impact analysis for branches
  - json: Generate dependency info as JSON

- so –bl <name>
  - Generate a deterministic library name given a branch name

Repository Cleanup

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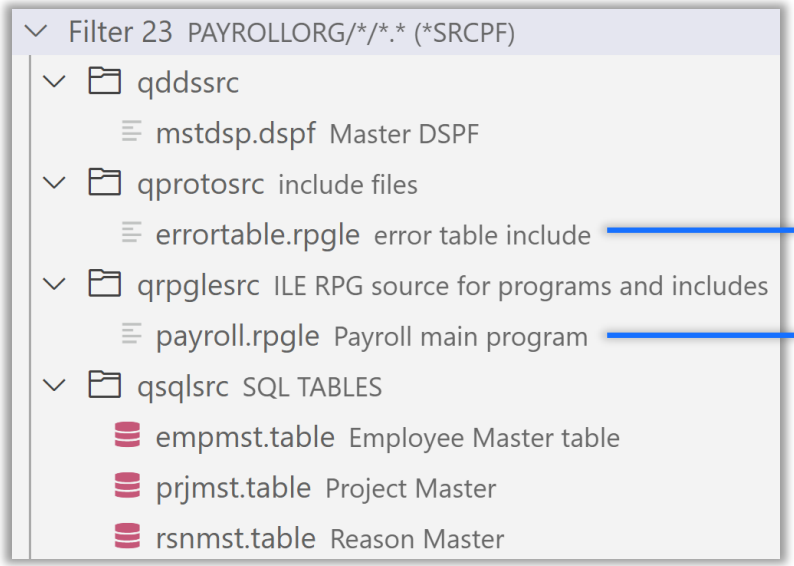
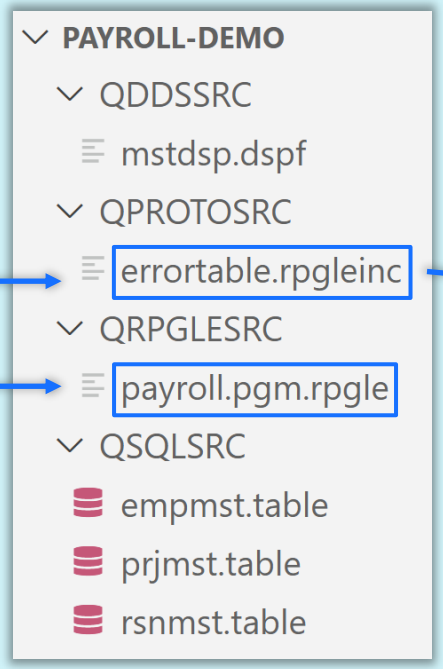
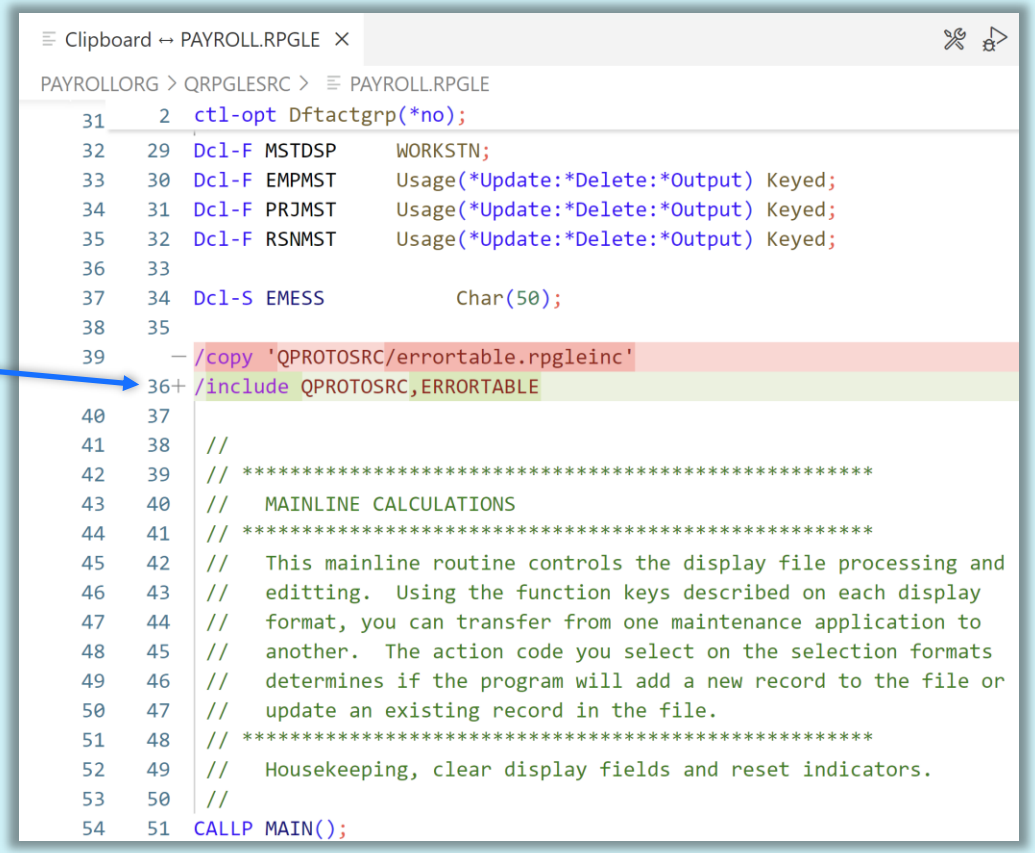
Source Locally



Original source in QSYS



Cleaned up file extensions



Cleaned up source code

Impact Analysis...What Objects Am I Affecting?

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Impacted objects based on source changes

Full project dependency tree

so-impact summary

Impact Analysis

Touched objects:

- NEMP.FILE : qddssrc/nemp.dspf

NEMP.FILE

▼Click to expand

- NEMP.FILE (qddssrc/nemp.dspf)
  - NEWEMP.PGM (qrpglesrc/newemp.pgm.sqlrpgle)
    - DEPTS.PGM (qrpglesrc/depts.pgm.sqlrpgle)

Messages

No messages to show.

Dependencies of impacted objects

Project Listing

▼Click to expand

-	Object	Type	Path	Warnings	Parents	Children
	DEPARTMENT	FILE	qddssrc/department.table	▶	▶2	0
	DEPTS	FILE	qddssrc/depts.dspf	✅	▶1	0
	EMPLOYEE	FILE	qddssrc/employee.table	▶	▶2	0
	EMPS	FILE	qddssrc/emps.dspf	✅	▶1	0
	NEMP	FILE	qddssrc/nemp.dspf	✅	▼1 NEWEMP.PGM	0
	POPDEPT	PGM	qddssrc/popdept.sql	▼ ⚠️ Extension should be based on type. Suggested name is 'popdept.sqlprc'	0	▶1
	POPEMP	FILE	qddssrc/popemp.sql	✅	0	0
	DEPTS	PGM	qrpglesrc/depts.pgm.sqlrpgle	▶	0	▶4
	EMPLOYEES	PGM	qrpglesrc/employees.pgm.sqlrpgle	▶	▶1	▶2
	MYPGM	PGM	qrpglesrc/mypgm.pgm.rpgle	▶	0	0
	NEWEMP	PGM	qrpglesrc/newemp.pgm.sqlrpgle	▶	▶1	▶2

- *Parents* are objects that depend on this object.
- *Children* are objects that this object depends on.

GitHub Action Example

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```yaml
jobs:
  so-impact:
    runs-on: ubuntu-latest
    steps:
      # Checkout repository and setup node steps omitted

      - name: Install Dependencies
        run: npm i -g @ibm/ibmi-ci

      - name: Generate impact information
        run: so -bf imd -l `git diff --name-only origin/main origin/${GITHUB_HEAD_REF}`

      - name: Adding markdown
        run: cat impact.md >> $GITHUB_STEP_SUMMARY
```

Generate impact analysis for changed files (compare main branch with pull request branch)

Redirect output to GITHUB_STEP_SUMMARY to create a custom Markdown job summary

What is built into the Source Orbit VS Code extension?

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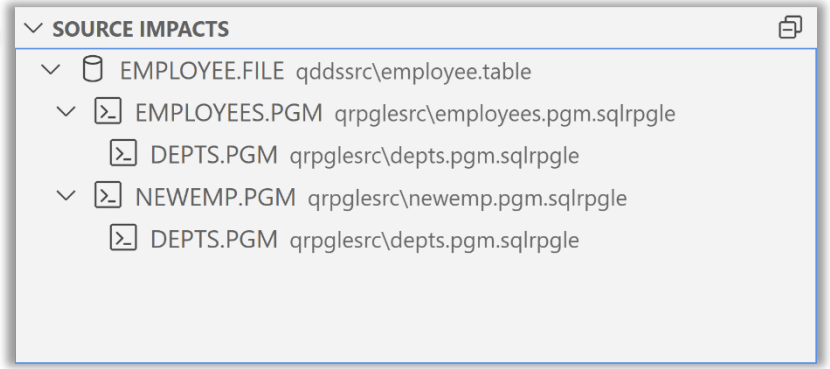
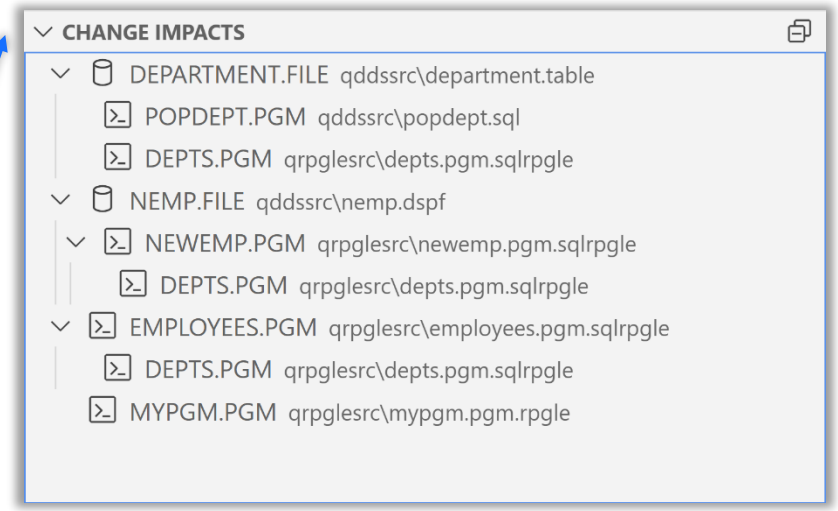
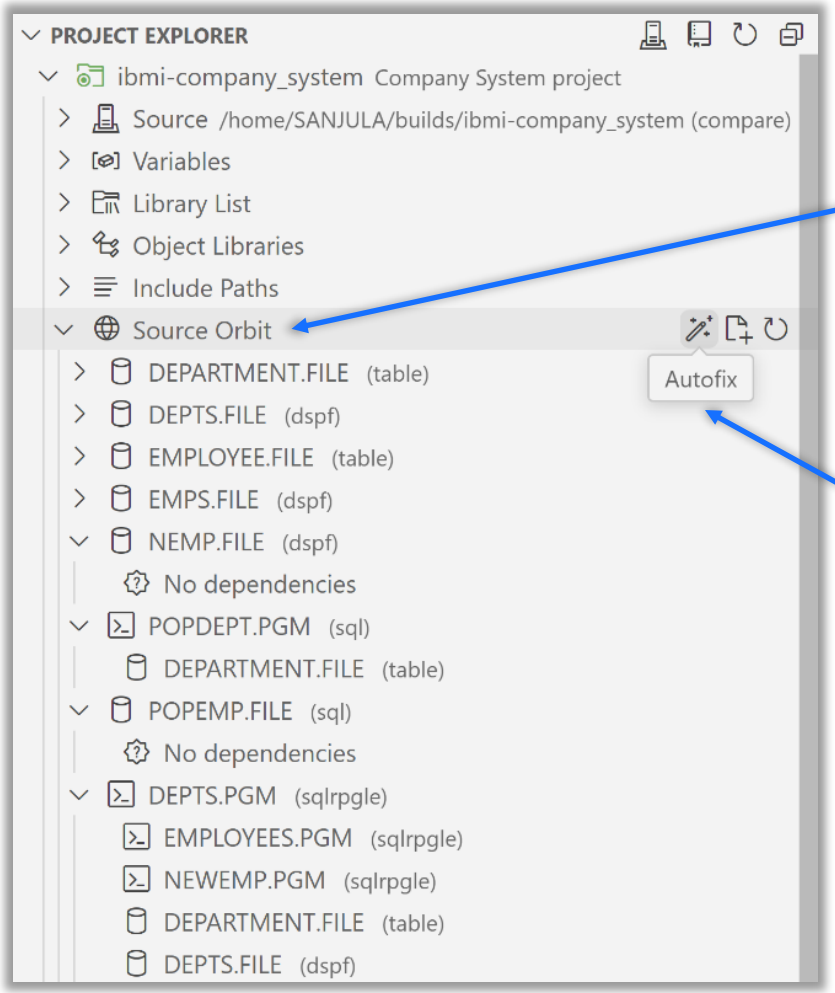
View impacted objects for the current active editor



View impacted objects for any changed files detected by Git



View project's dependency tree with integration in IBM i Project Explorer



Actions to "Autofix" and "Generate Build Files"

Source migration made easy

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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

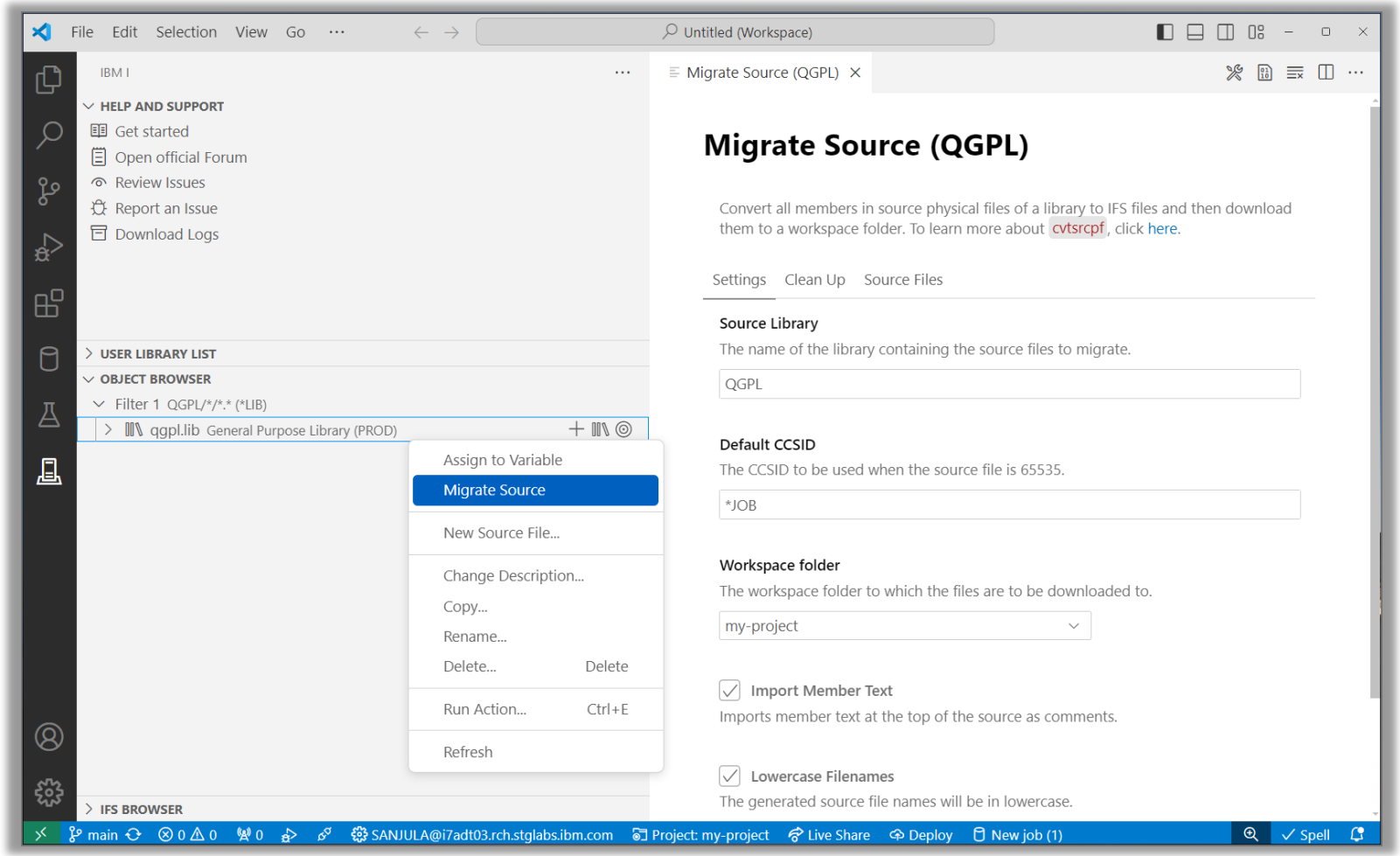
↓

Source Orbit

Rename extensions

↓

Convert includes/copy directives to Unix style paths



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Use Cases

Impact Analysis

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Automated Builds

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Demo

Any Questions?

Important Links

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ibmi-ci

- NPM https://www.npmjs.com/package/@ibm/ibmi-ci
- GitHub Repository https://github.com/IBM/ibmi-ci

Source Orbit

- NPM https://www.npmjs.com/package/@ibm/sourceorbit
- Extension https://marketplace.visualstudio.com/items?itemName=IBM.vscode-sourceorbit
- Documentation https://ibm.github.io/sourceorbit/#/
- GitHub Repository https://github.com/IBM/sourceorbit

For More Information

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IBM i Home Page: https://www.ibm.com/it-infrastructure/power/os/ibm-i (find link to Forrester Study and updated IBM i Strategy Whitepaper) IBM Strategy Whitepaper: https://www.ibm.com/it-infrastructure/us-en/resources/power/i-strategy-roadmap/ IBM Client Success: https://www.ibm.com/it-infrastructure/us-en/resources/power/ibm-i-customer-stories/ Support Life Cycle: https://www.ibm.com/support/lifecycle/ License Topics: https://www-01.ibm.com/support/docview.wss?uid=nas8N1022087 Fortra IBM i Marketplace Survey https://www.fortra.com/resources/guides/ibm-i-marketplace-survey-results	 @IBMSystems @COMMONug @IBMChampions @IBMSystemsISVs @IBMiMag @ITJungleNews @SAPonIBMi @SiDforIBMi	#PowerSystems #IBMi #IBMAIX #POWER9 #LinuxonPower #OpenPOWER #HANAonPower #ITinfrastructure #OpenSource #HybridCloud #BigData