

Automated build systems

For IBM i

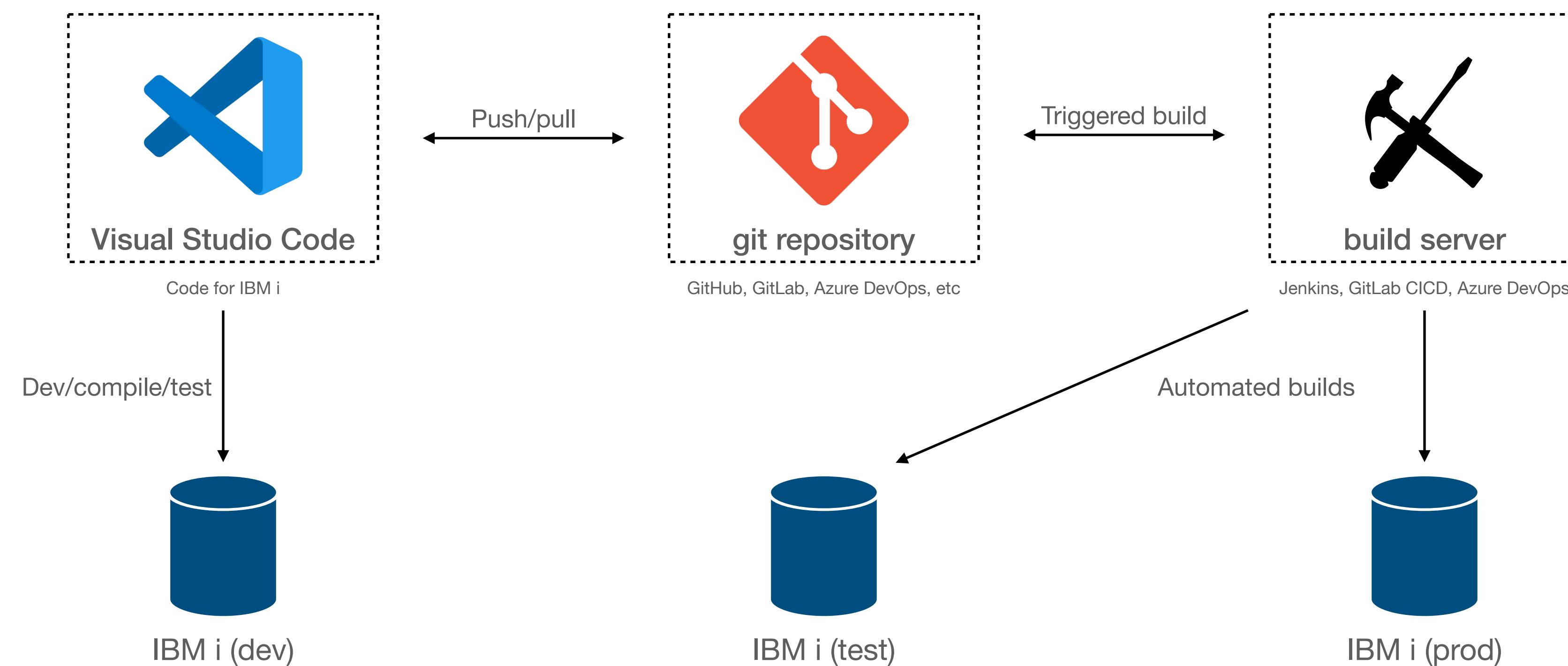
Liam Allan

Agenda

- Assumption of git knowledge
- High level flow of development lifecycle
- Tools used for automation
- Real world examples
- Automated IBM i deploy demo

Overview

Simple overview



Specifics

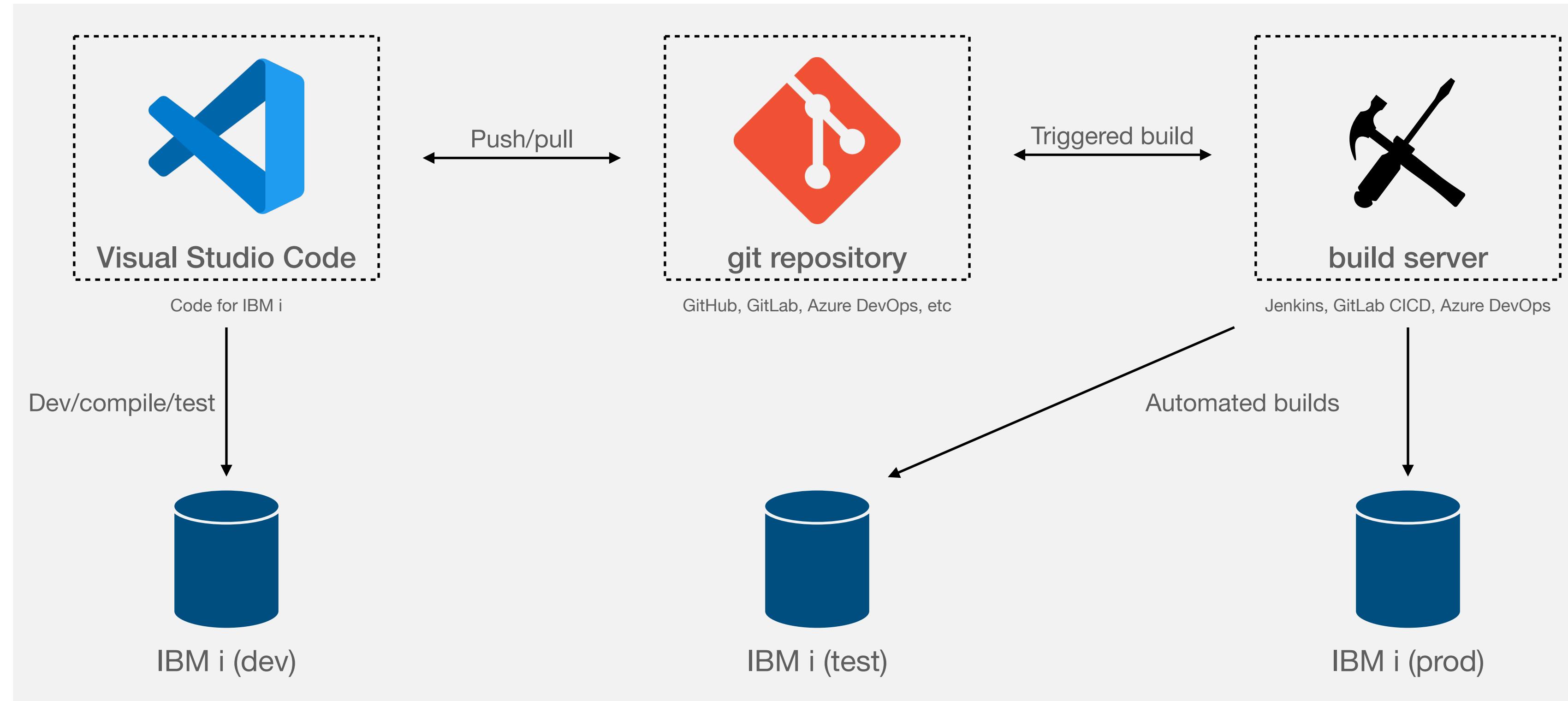
Everything on this slide can be achieved using OSS technology:

Code for IBM i
Source Orbit
IBM i CI

- Code for IBM i
- Local ILE development
- Source code in git
- Developer uses any extension they like
- Easy for us to push update to
- Devs make use of Source Orbit

(could also be VS Code inside of Merlin)

Visual Studio Code



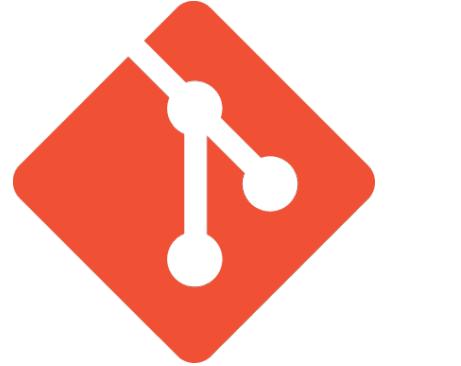
- IBM provides Source Orbit (SO)
- SO provides impact analysis
- SO generates build information
- Used as a VS Code extension and as part of CICD

Build tools

- Business can use any build server they like
- Can use SO to automate their impact analysis and builds
- Can deploy to as many pre-configured servers as they wish
- Impact analysis happens on build server, compile happens on IBM i

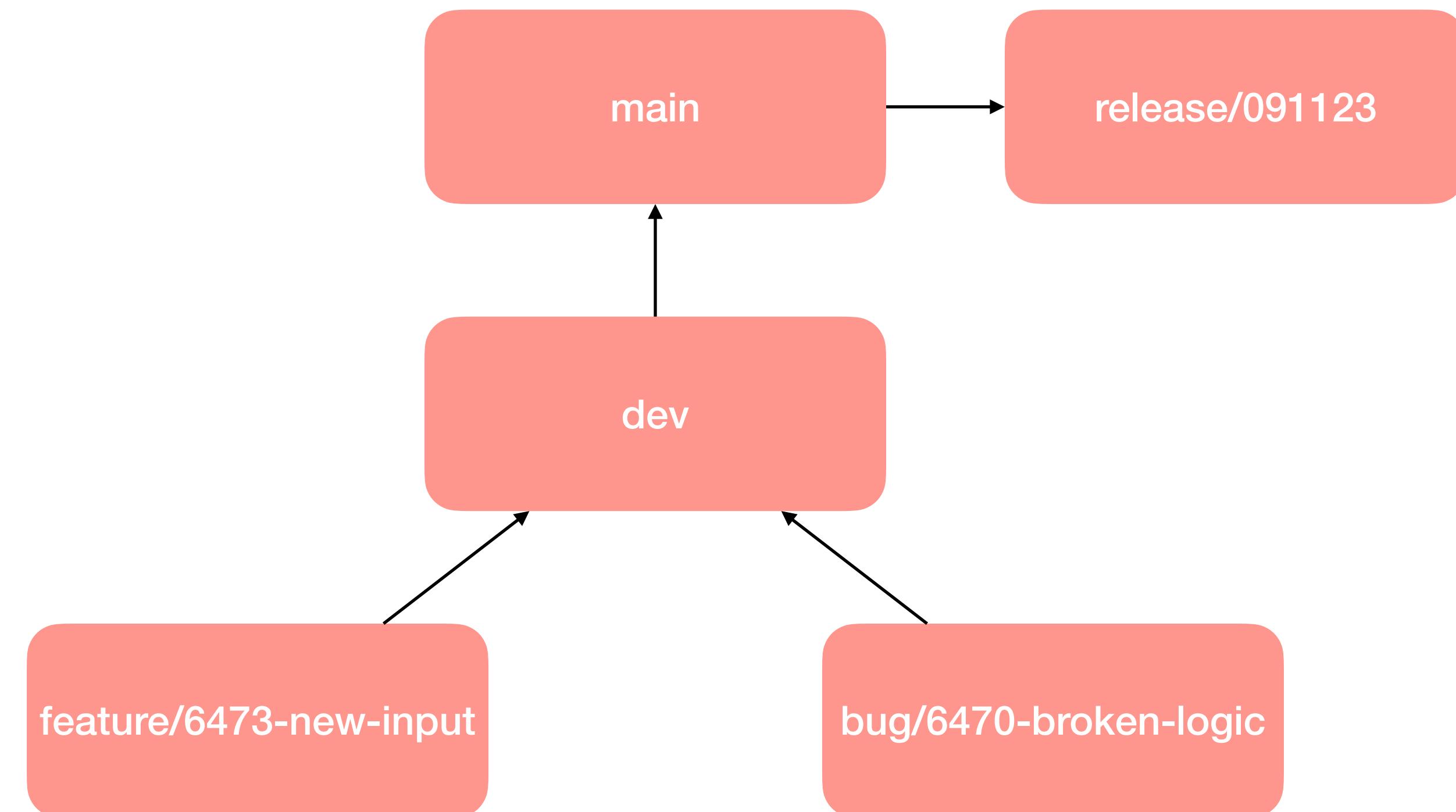
Build server

Development with git



git repository

GitHub, GitLab, Azure DevOps, etc

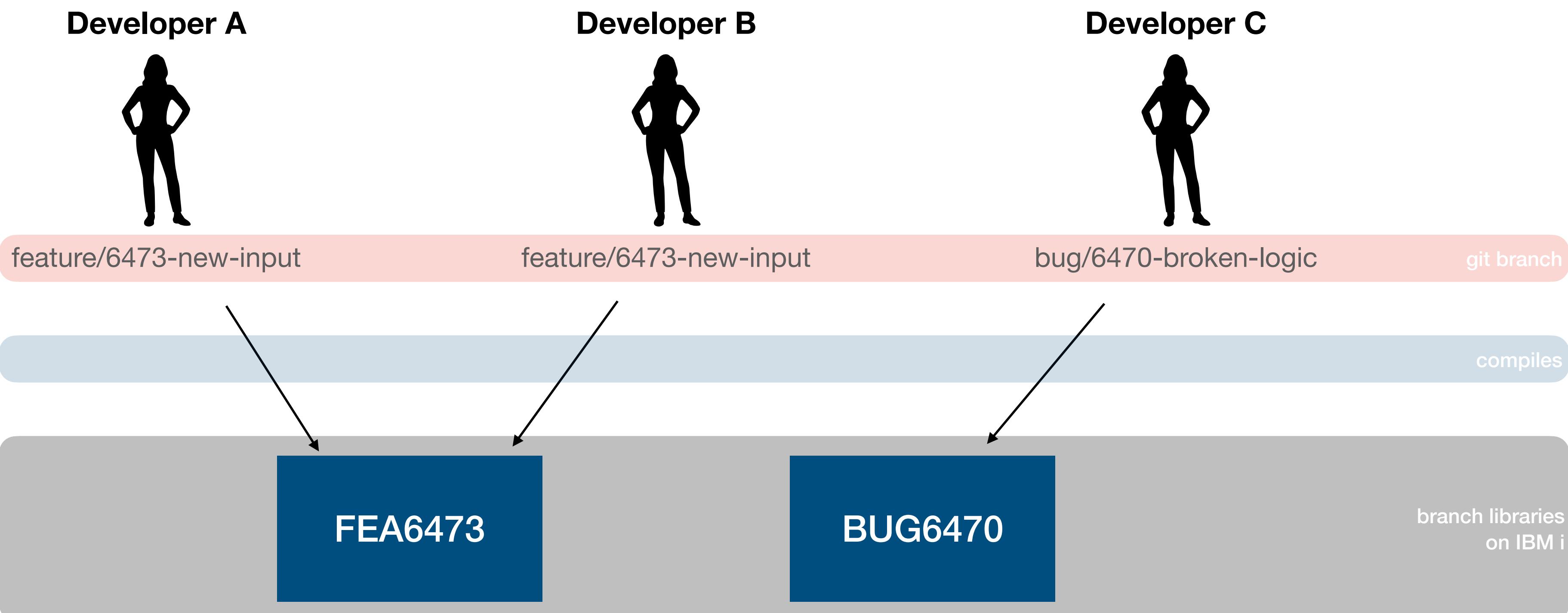


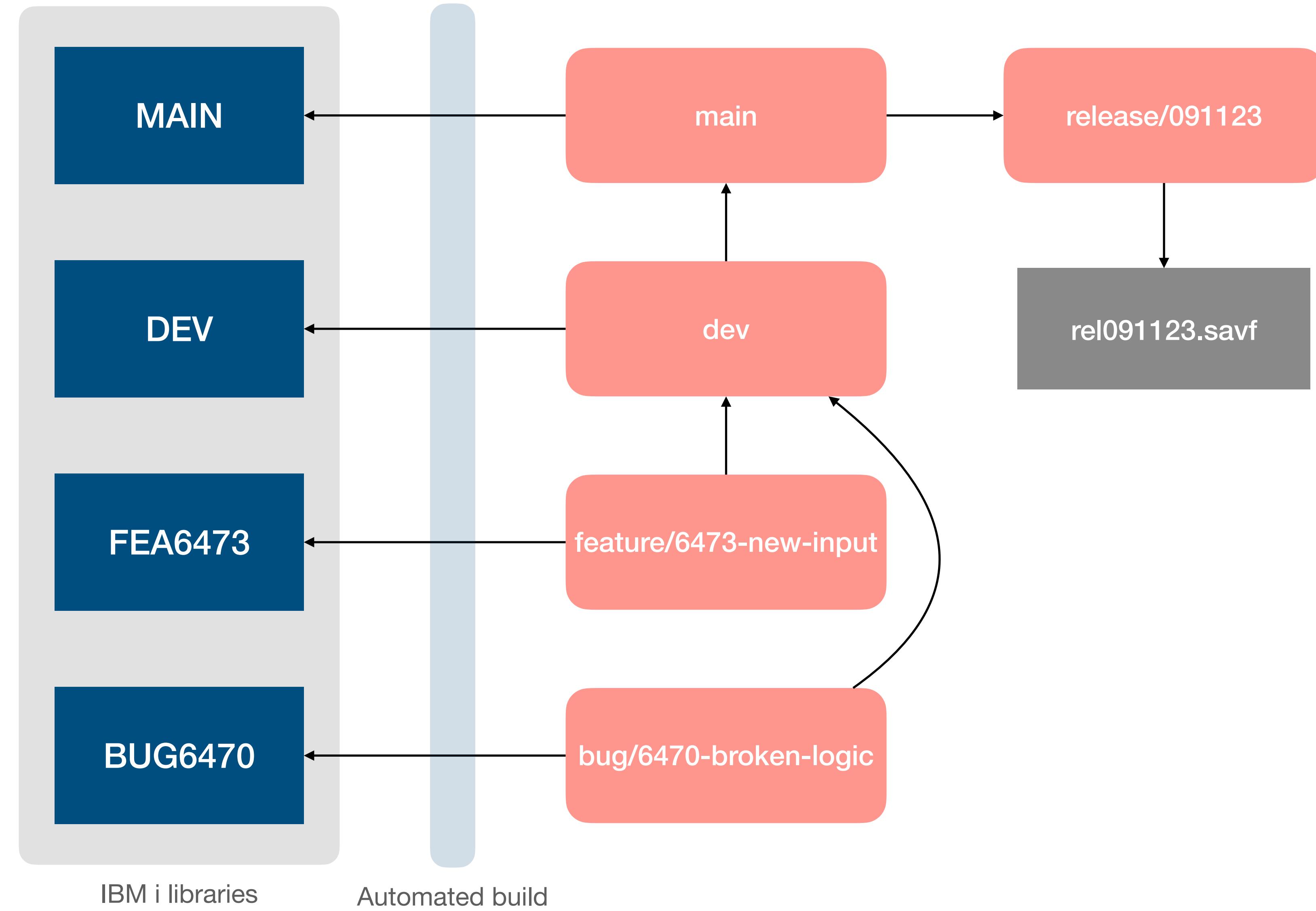
Development with git

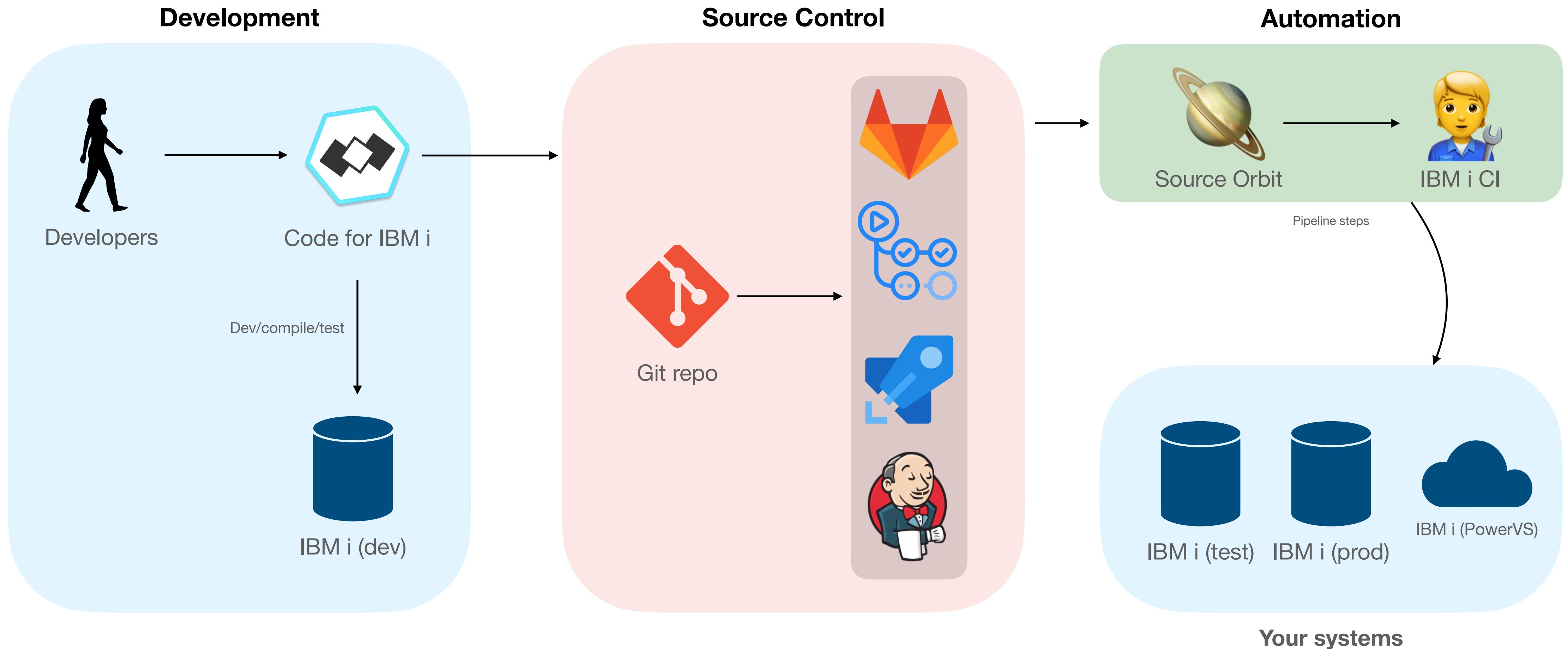


Visual Studio Code

Code for IBM i

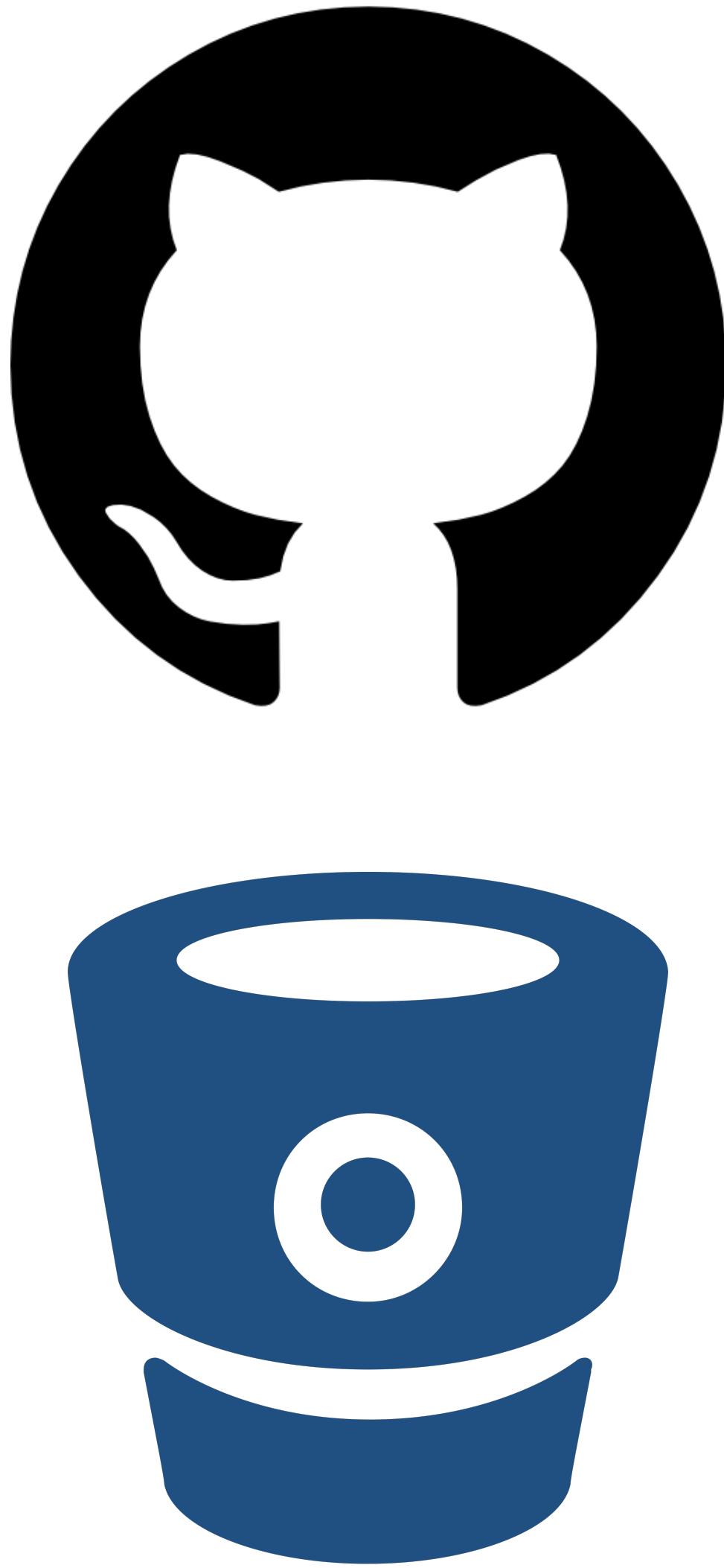




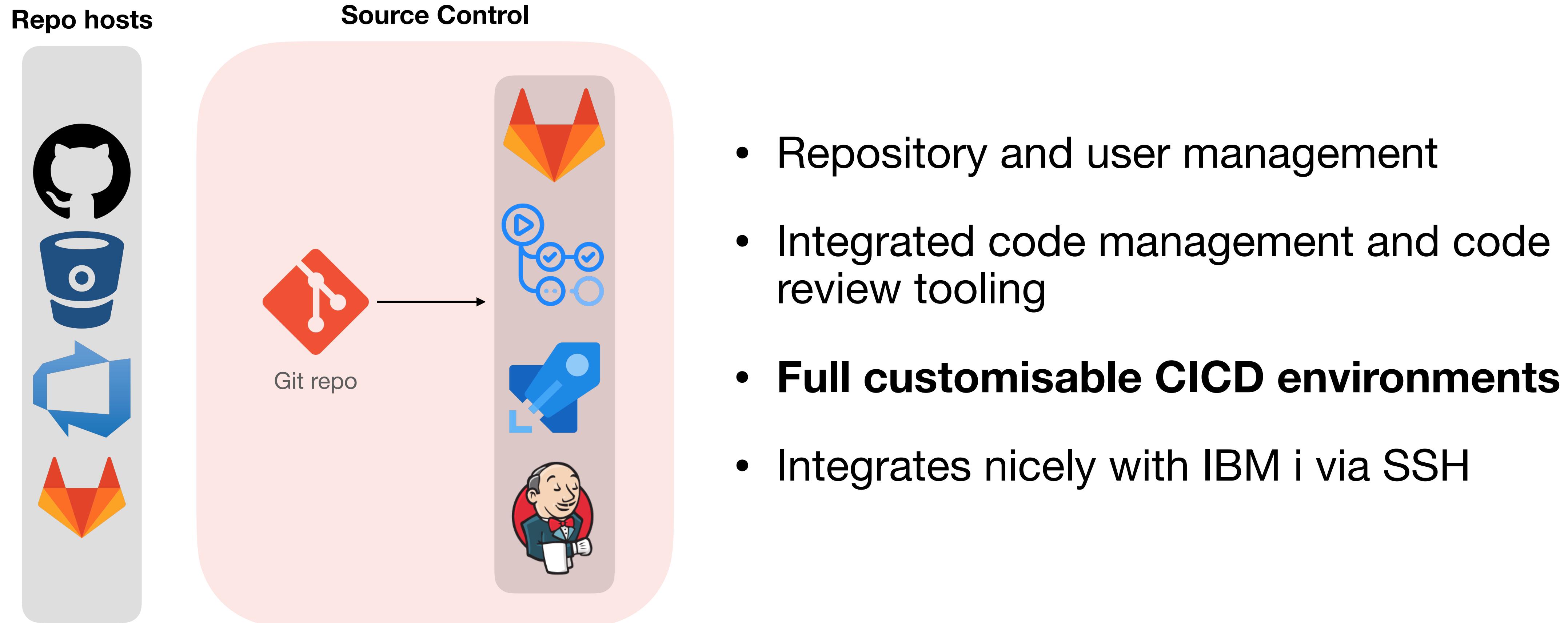


Tools used

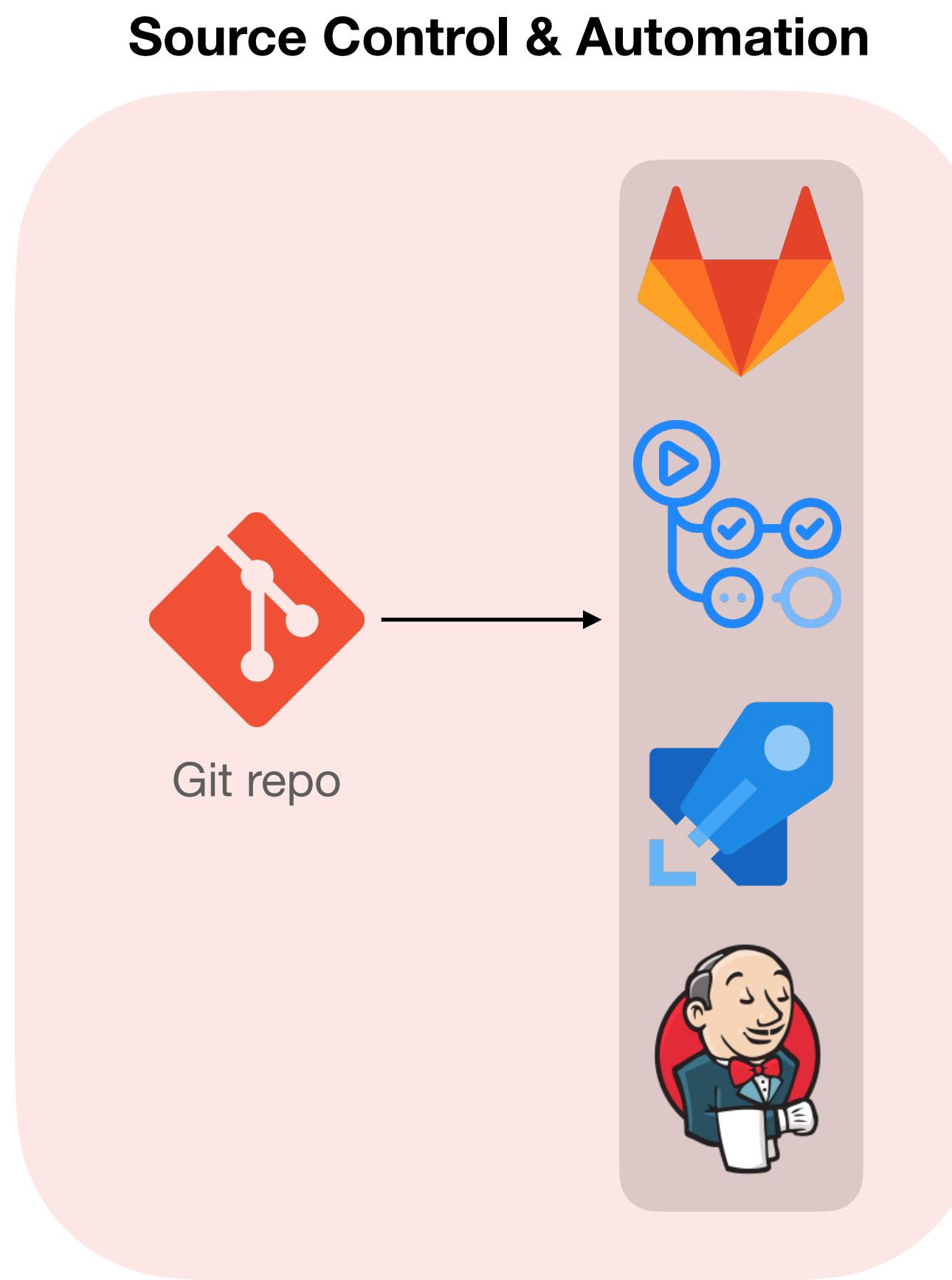
Popular git and CICD platforms



Git tooling and automation



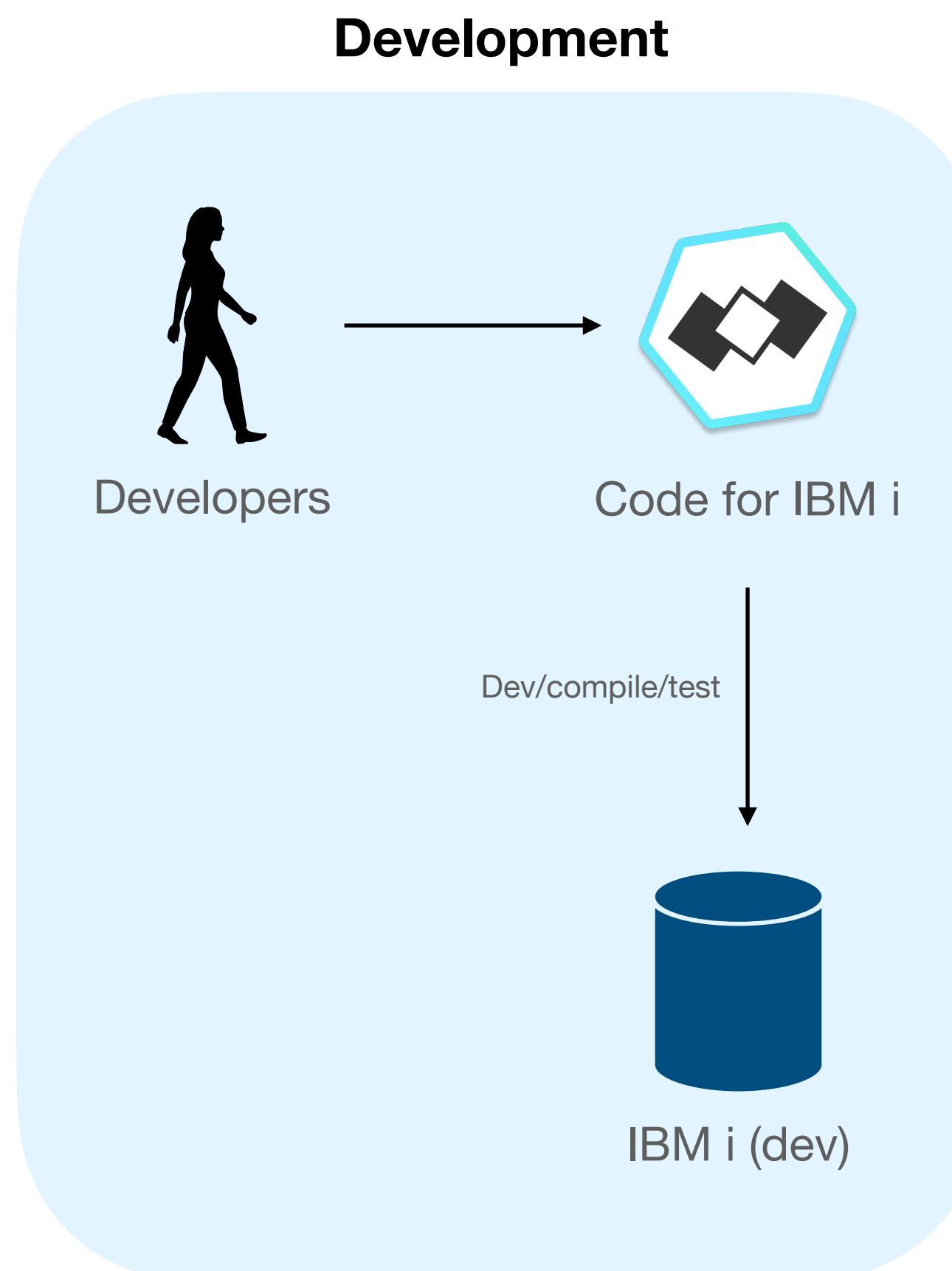
Automation steps



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

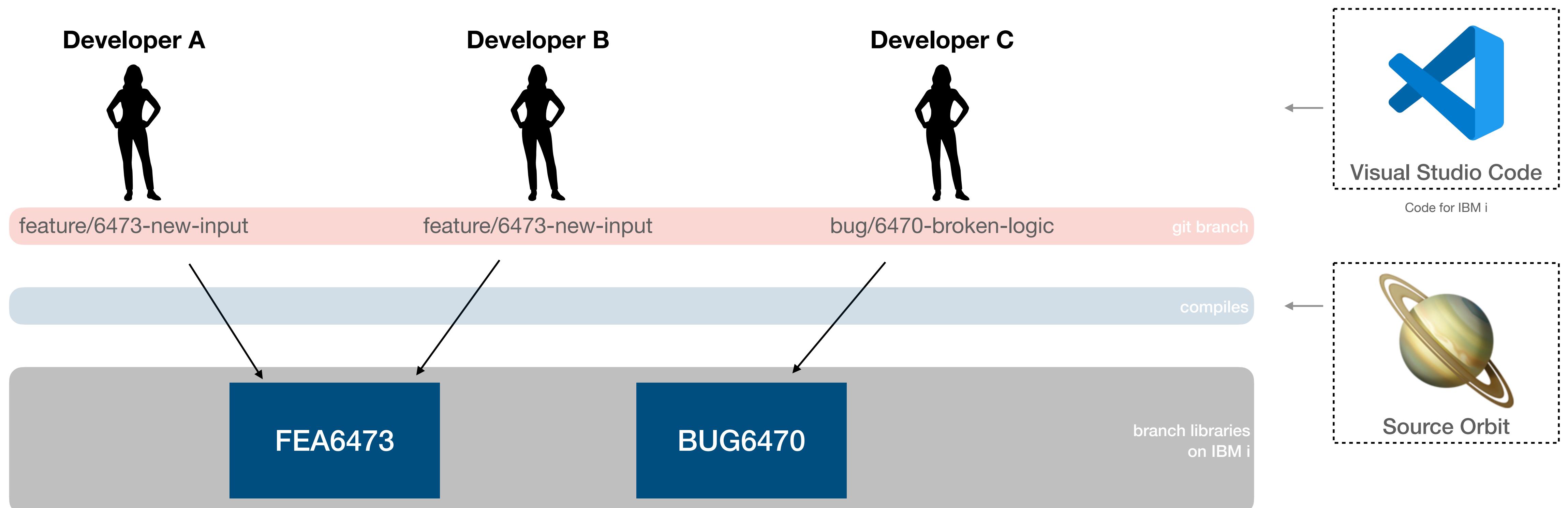
yml can also be yaml

Visual Studio Code

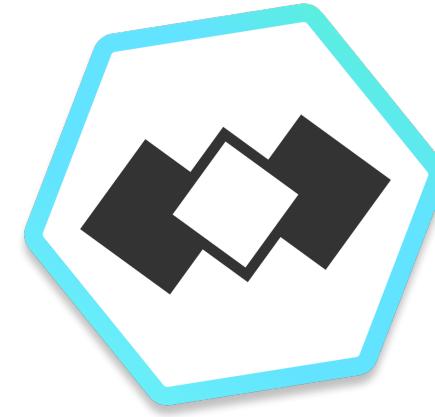


- First class git support
- IBM i integration via extensions
- Access to hundreds of git tools
- Integrates with vendors or self-managed tools
- RPGLE, COBOL, CL, SQL, and more

Development for IBM i



Tools available



Code for IBM i



Source Orbit



IBM i CI



Better Object Builder
for IBM i

Source Orbit

ILE dependency analysis

Source Orbit



What does it do?

- It's a CLI tool
- Build dependency lists for RPGLE, DDS, SQL, CL, etc
- Generate impact analysis information
- Create scripts to automate builds of your application code
- Cleans up your repository
- It's open-source!

```
[barry@Liams-MBP ics % so -h

-d <dir>
--cwd <dir>      To see the directory of where source code lives.
                  The default is the current working directory.

-f <relative paths>
--files <relative paths>
                  this option will still scan the entire working
                  directory, but will single out these specific files
                  when generating other files. If no build file is
                  specified, dependencies will be printed.

-bf make|bob|imd|json  Create build files of a specific format
                      Example: -bf make

-bl <name>        Set the BRANCHLIB environment variable based on
                  a user provided branch name, and will write it out.
                  Example: -bl feature/123-cool-idea
                  -bl bug/123-bad-move

Options for project cleanup:

-ar               Run the auto-rename process after scanning all code
                  Ensure it is run inside of source control.
                  Rename program sources to have the '.pgm.' attribute in the name
                  Rename RPGLE copybooks found (based on include statements) to be '.rpgleinc'

-fi               Fix includes for RPGLE sources
                  Ensure it is run inside of source control.
```

Repository cleanup

The screenshot shows a code editor interface with two panes comparing two versions of a RPGLE program, BBSADNUDFR.pgm.rpgle, from a repository named BBS400.

Left Pane (Original Code):

```
1 H/TITLE Administration - New User default values
2 H COPYRIGHT('© 2020 David Asta under MIT License')
3 * SYSTEM : V4R5
4 * PROGRAMMER : David Asta
5 * DATE-WRITTEN: 25/NOV/2020
6 *
7 * This program allows an Administrator user to display/change the
8 * New User default values
9 ****
10 H/COPY DVBB5400/CURRENTSRC,CBKOPTIMIZ
11 ****
12 * INDICATORS USED:
13 * 80 - *ON turns DSPATR(PR), which protects fields from being change
14 * 81 - CBKPCFGREA CHAIN Not Found
15 ****
16 FBBSADNUDFDCF E WORKSTN
17 FPCONFIG UF E K DISK
18 ****
19 * Data structures
20 D/COPY DVBB5400/CURRENTSRC,CBKDTAARA
21 * Constants
22 D cKeysDft C CONST('F10>Edit F12=Go back')
23 D cKeysEdit C CONST('F10=Confirm Changes F1
24 D cel')
25 D cSavedOK C CONST('Configuration was change
26 D cessfully.')
27 D cSavedKO C CONST('There was an error while
28 D ting to PCONFIG.')
29 * Variables
30 D/COPY DVBB5400/CURRENTSRC,CBKPCFGDCL
31 D wCfgKey S 6A
32 ****
33 C WRITE HEADER
34 C 80 EVAL KEYSLS = cKeysDft
35 C N80 EVAL KEYSLS = cKeysEdit
36 C WRITE FOOTER
37 C EXFMT BODY
38 C CLEAR MSGLIN
39 C EXSR CheckFkeys
40 ****
41 * Subroutine called automatically at startup
42 ****
43 C *INZSR BEGSR
44 C EVAL SCRSCR = 'BBSADNUDF'
45 * Protect fields from being modified
46 C EVAL *IN80 = *ON
47 * Get values from PCONFIG and show them on screen
```

Right Pane (Corrected Code):

```
1 H/TITLE Administration - New User default values
2 H COPYRIGHT('© 2020 David Asta under MIT License')
3 * SYSTEM : V4R5
4 * PROGRAMMER : David Asta
5 * DATE-WRITTEN: 25/NOV/2020
6 *
7 * This program allows an Administrator user to display/change the
8 * New User default values
9 ****
10 /copy 'src/CBKOPTIMIZ.rpgleinc'
11 ****
12 * INDICATORS USED:
13 * 80 - *ON turns DSPATR(PR), which protects fields from being change
14 * 81 - CBKPCFGREA CHAIN Not Found
15 ****
16 FBBSADNUDFDCF E WORKSTN
17 FPCONFIG UF E K DISK
18 ****
19 * Data structures
20 /copy 'src/CBKDTAARA.rpgleinc'
21 * Constants
22 D cKeysDft C CONST('F10>Edit F12=Go back')
23 D cKeysEdit C CONST('F10=Confirm Changes F1
24 D cel')
25 D cSavedOK C CONST('Configuration was change
26 D cessfully.')
27 D cSavedKO C CONST('There was an error while
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29 * Variables
30 /copy 'src/CBKPCFGDCL.rpgleinc'
31 D wCfgKey S 6A
32 ****
33 C WRITE HEADER
34 C 80 EVAL KEYSLS = cKeysDft
35 C N80 EVAL KEYSLS = cKeysEdit
36 C WRITE FOOTER
37 C EXFMT BODY
38 C CLEAR MSGLIN
39 C EXSR CheckFkeys
40 ****
41 * Subroutine called automatically at startup
42 ****
43 C *INZSR BEGSR
44 C EVAL SCRSCR = 'BBSADNUDE'
45 * Protect fields from being modified
46 C EVAL *IN80 = *ON
47 * Get values from PCONFIG and show them on screen
```

The code editor interface includes an Explorer sidebar on the left, a Project Explorer section at the bottom left, and a Job Log section at the bottom right. The status bar at the bottom shows file statistics like 'ggggg*' and 'Project: GitLens Pro (Trial)'.

Show code in a repository where the copy statements have been corrected

Impact Analysis

The screenshot shows the GitHub Actions interface for a pull request titled "Update utils.sqlrpgle #1". The "Actions" tab is selected. A summary card for the "Code scan (18.x)" job is displayed, showing it was triggered via a pull request 2 hours ago by "worksofliam" and is currently "Success" with a total duration of 22s. Below this, the "impact.yaml" configuration file is shown, indicating a "Matrix: Code scan" with 1 job completed. The "Code scan (18.x) summary" section displays the "Impact Analysis" results.

Touched objects:

- UTILS MODULE : qrpglesrc/utils.sqlrpgle

UTILS MODULE :

- UTILS MODULE (qrpglesrc/utils.sqlrpgle)
 - UTILS.SRVPGM (qsrvsrc/utils.bnd)
 - DEPTS.PGM (qrpglesrc/depts.pgm.sqlrpgle)
 - \$(APP_BNDDIR).BNDDIR (no source)

The screenshot shows the "Code scan (18.x) summary" page. It starts with a "Summary" section for the "Code scan (18.x)" job, which is successful. Below this is the "Impact Analysis" section.

Touched objects:

- BANKING MODULE : qrpglesrc/banking.sqlrpgle
- DEPTS.PGM : qrpglesrc/depts.pgm.sqlrpgle
- UTILS MODULE : qrpglesrc/utils.sqlrpgle
- UTILS.SRVPGM : qsrvsrc/utils.bnd

BANKING MODULE :

- BANKING MODULE (qrpglesrc/banking.sqlrpgle)
 - BANKING.SRVPGM (no source)
 - \$(APP_BNDDIR).BNDDIR (no source)

DEPTS.PGM :

- DEPTS.PGM (qrpglesrc/depts.pgm.sqlrpgle)

Changes to this object have no impact.

UTILS MODULE :

- UTILS MODULE (qrpglesrc/utils.sqlrpgle)
 - UTILS.SRVPGM (qsrvsrc/utils.bnd)
 - DEPTS.PGM (qrpglesrc/depts.pgm.sqlrpgle)
 - \$(APP_BNDDIR).BNDDIR (no source)

pr.yaml

```
name: Source Orbit Impact Report

on:
  pull_request:
    types: [opened]

jobs:
  so-impact:
    runs-on: ubuntu-latest
    steps:
      - uses: actions/checkout@v4
        with:
          fetch-depth: 0

      - uses: actions/setup-node@v3
        with:
          node-version: 18

      - run: npm i -g @ibm/sourceorbit

      - 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
```



sourceorbit 0.4.25

Latest

IBM i dependency management tool

Install from the command line:

```
$ npm install @ibm/sourceorbit@0.4.25
```

[Learn more about npm packages](#)

Install via package.json:

```
"@ibm/sourceorbit": "0.4.25"
```

Recent Versions

0.4.25

Latest

Details

IBM

sourceorbit

Apache License 2.0

12 dependencies

Readme

Last published

17 minutes ago

Issues

1

Total downloads

44

.↓. 4

ibmi-ci

Simple SSH tool

CLI usage

```
ici \
  --rcwd "./builds/myproject" \
  --push "." \
  --cmd "/QOpenSys/pkgs/bin/gmake BIN_LIB=MYLIB"
```

Pipeline step

```
jobs:  
  so-impact:  
    environment: COMMON1  
    runs-on: ubuntu-latest  
    steps:  
      # install S0 and ibmi-ci  
  
      - name: Generate makefile  
        run: so -bf make -l `git diff --name-only origin/main origin/${GITHUB_HEAD_REF}`  
  
      - 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 LIBL='CMPSYS' BIN_LIB=$(so -bl ${GITHUB_HEAD_REF})"  
    env:  
      IBMI_HOST: ${{ secrets.IBMI_HOST }}  
      IBMI_USER: ${{ secrets.IBMI_USER }}  
      IBMI_PASSWORD: ${{ secrets.IBMI_PASSWORD }}  
      IBMI_SSH_PORT: ${{ secrets.IBMI_SSH_PORT }}
```



ibmi-ci 0.1.1

Latest

IBM i CLI tool

Install from the command line:

```
$ npm install @ibm/ibmi-ci@0.1.1
```

[Learn more about npm packages](#)

Install via package.json:

```
"@ibm/ibmi-ci": "0.1.1"
```

Details

IBM

ibmi-ci

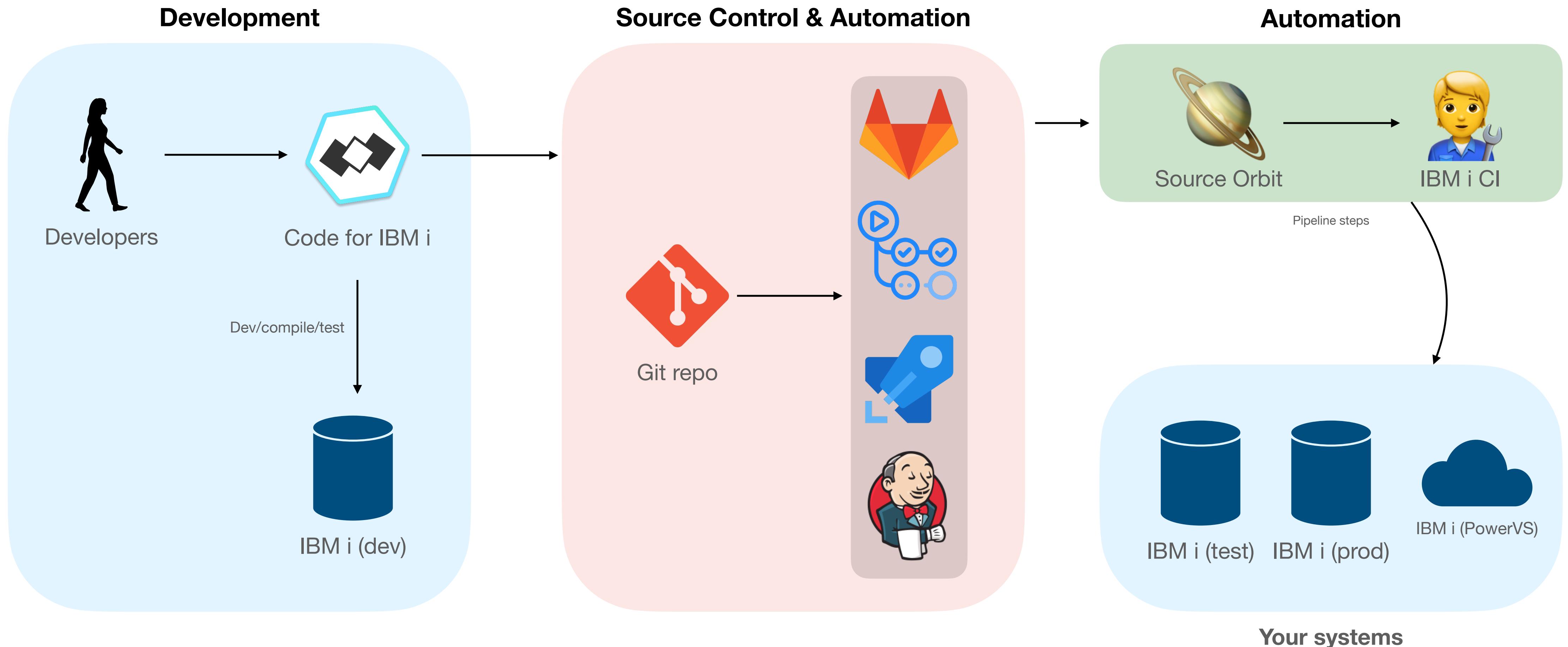
5 dependencies

Readme

Last published

12 hours ago

Development	Code for IBM i RDi	Developer writes and compiles code
Dependency management Impact analysis	Source Orbit	Automated tools to generate build scripts and impact analysis reports automatically
Deployment	IBM i CI	Deploys code to IBM i and runs the build scripts automatically



Use case: Impact Analysis

Open a pull request

The change you just made was written to a new branch named [fix/text_colour](#). Create a pull request below to propose these changes. [Learn more about diff comparisons here.](#)

base: main ▾ ← compare: fix/text_colour ▾ ✓ **Able to merge.** These branches can be automatically merged.



Add a title

Update emps.dspf

Add a description

Write Preview



A simple update to function key description text from blue to white.|

Create pull request ▾

ⓘ Remember, contributions to this repository should follow our [GitHub Community Guidelines](#).

Reviewers

No reviews

Assignees

No one—assign yourself

Labels

None yet

Projects

None yet

Milestone

No milestone

Development

Use [Closing keywords](#) in the description to automatically close issues

Helpful resources

[GitHub Community Guidelines](#)

-o 1 commit

± 1 file changed

👤 1 contributor

-o Commits on Nov 12, 2023

Update emps.dspf

worksofliam committed now

Verified

cac56e7



Update emps.dspf #20

[Open](#)

worksofliam wants to merge 1 commit into [main](#) from [fix/text_colour](#) 



Conversation 0

-o Commits 1

E Checks 0

+ Files changed 1



worksofliam commented now

Member ...

A simple update to function key description text from blue to white.



-o Update emps.dspf

Verified

cac56e7

Add more commits by pushing to the [fix/text_colour](#) branch on [IBM/ibmi-company_system](#).



Some checks were not successful

1 queued and 1 action required checks

[Hide all checks](#)

● **Source Orbit Impact Report / so-impact (pull_request)** Queued — Waiting to run this check... [Details](#) 

✗ **DCO** Action required after 1s — DCO [Details](#)



This branch has no conflicts with the base branch

Merging can be performed automatically.

[Merge pull request](#)



You can also [open this in GitHub Desktop](#) or view [command line instructions](#).



GitHub Actions: Speed up build times with [larger GitHub-hosted runners](#) 

[← Back to pull request #20](#)

✓ Update emps.dspf #8

[Re-run all jobs](#)

...

Summary

Jobs

✓ so-impact

Run details

⌚ Usage

⤷ Workflow file

Triggered via pull request 2 minutes ago

 worksofliam opened #20 fix/text_colour

Status

Success

Total duration

18s

Artifacts

so-impact summary

...

Impact Analysis

Touched objects:

-  EMPS.FILE : qddssrc/emps.dspf

EMPS.FILE

-  EMPS.FILE (qddssrc/emps.dspf)
 -  EMPLOYEES.PGM (qrpglesrc/employees.pgm.sqlrpgle)
 -  DEPTS.PGM (qrpglesrc/depts.pgm.sqlrpgle)

```

name: Source Orbit Impact Report

on:
  pull_request:
    types: [opened]

jobs:
  so-impact:
    runs-on: ubuntu-latest
    permissions:
      packages: read
      issues: write
      pull-requests: write
      contents: read
    steps:
      - uses: actions/checkout@v4
        with:
          fetch-depth: 0

      - uses: actions/setup-node@v3
        with:
          node-version: 18
          registry-url: https://npm.pkg.github.com/

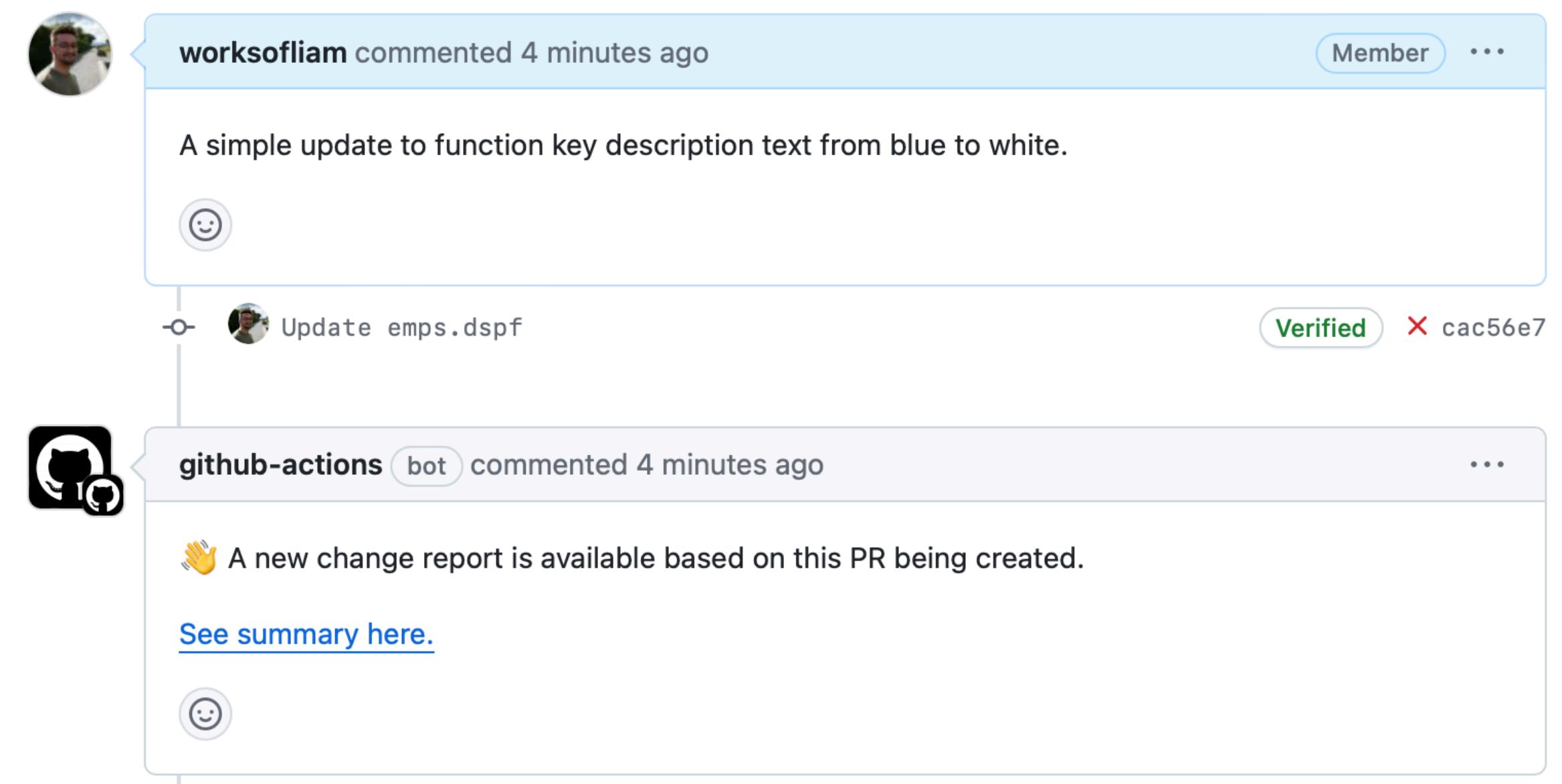
      - run: npm i -g @ibm/sourceorbit
        env:
          NODE_AUTH_TOKEN: ${{secrets.GITHUB_TOKEN}}

      - 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

      - name: Post comment
        uses: actions/github-script@v5
        with:
          script: |
            github.rest.issues.createComment({
              issue_number: context.issue.number,
              owner: context.repo.owner,
              repo: context.repo.repo,
              body: '👏 A new change report is available based on this PR being created. ...'
            })

```



Use case: Automated builds

```

jobs:
  so-impact:
    environment: COMMON1
    runs-on: ubuntu-latest
    steps:
      - name: Generate makefile
        run: so -bf make -l `git diff --name-only origin/main origin/${GITHUB_HEAD_REF}`
      - name: Deploy to IBM i
        run:
          - |
            ici \
              --cmd "mkdir -p './builds/ics_${GITHUB_HEAD_REF}'" \
              --rcwd "./builds/ics_${GITHUB_HEAD_REF}" \
              --push "." \
              --cmd "/QOpenSys/pkgs/bin/gmake LIBL='CMPSYS' BIN_LIB=$(so -bl ${GITHUB_HEAD_REF})"
    env:
      IBMI_HOST: ${{ secrets.IBMI_HOST }}
      IBMI_USER: ${{ secrets.IBMI_USER }}
      IBMI_PASSWORD: ${{ secrets.IBMI_PASSWORD }}
      IBMI_SSH_PORT: ${{ secrets.IBMI_SSH_PORT }}

```

Environments / Configure COMMON1

Environment secrets

Secrets are encrypted environment variables. They are accessible only by GitHub Actions in the context of this environment.

 IBMI_HOST	Updated 20 minutes ago	 
 IBMI_PASSWORD	Updated 10 minutes ago	 
 IBMI_SSH_PORT	Updated 19 minutes ago	 
 IBMI_USER	Updated 11 minutes ago	 
+ Add secret		

Multiple environments can be configured in your org/repo

github.com

Dashboard

worksofliam

Top Repositories

New

Find a repository...

codefori/vscode-ibmi

codefori/vscode-db2i

codefori/vscode-rpgle

IBM/sourceorbit

codefori/rmake

codefori/docs

IBM/ibmi-company_system

Show more

Recent activity

codefori/vscode-rpgle Refactor subroutine under new Code Action

codefori/vscode-rpgle Content assist issues (punctuation characters)

codefori/vscode-ibmi Move CL runner logic to new extension

barrettotte/vscode-ibmi-languag... RPGLE language needs wordPattern to include punctuation

Home

Send feedback

Filter 8

remotion-dev/remotion published 2 releases · See more

12 minutes ago

v4.0.95

Fixes a regression which was still not fixed in 4.0.94 (@remotion/zod-types became unexpectedly mandatory)

What's Changed

- Docs: New "terminology" section + mention Serve URL in command line by [@Jo...](#)

[Read more](#)

Contributors

v4.0.94

What's Changed

Fixes a regression in 4.0.89 where `zod` and `@remotion/zod-types` became mandatory.

- `@remotion/bundler` : Allow missing `zod` and `@zod-types` imports when bundling Studio by [@JonnyBurger](#) in #...

[Read more](#)

Latest changes

- 3 hours ago CodeQL 2.16: Python Dependency Installation...
- Yesterday Migrating GitHub Classroom Assignment Repository Creatio...
- 5 days ago GitHub Issues & Projects – Project status updates & issues...
- 5 days ago Copilot – January 18th update

[View changelog →](#)

Explore repositories

recharts / recharts

Redefined chart library built with React and D3

21.8k TypeScript

HTTPArchive / almanac.httparchive.org

HTTP Archive's annual "State of the Web" report made by the web community

584 HTML

Demo