Experiment 02

Aim:

To perform various Git operations on local and remote repositories using a Git cheat sheet and explore core version control features such as initialization, committing, branching, merging, pushing, pulling, and conflict management.

Theory:

Git is a distributed version control system (DVCS) used for tracking changes in source code during software development. It allows multiple developers to work simultaneously on a project, efficiently managing code changes, historical versions, and collaboration. Git forms the backbone of many modern **DevOps workflows**, enabling CI/CD (Continuous Integration/Continuous Deployment), automation, and versioned deployments.

Importance of Git in DevOps:

- **Version Control**: Every file change is tracked. You can revert to a previous state, compare changes, or recover lost data.
- **Team Collaboration**: Git enables branching so multiple developers can work independently and merge changes later.
- **Code Integrity**: Changes can be reviewed, tested, and only then merged—ensuring quality and reliability.
- **Deployment Ready**: Git integrates easily with deployment platforms like **Netlify**, **Vercel**, **GitHub Actions**, etc.

Key Git Concepts & Commands:

1. **Configuration**:
    - git config is used to set user-specific configurations like name and email for commits.
2. **Repository Setup**:
    - git init initializes a local repository.
    - git clone <url> clones a remote repository to the local machine.
3. **Staging & Committing**:
    - git add stages changes.
    - git commit -m "message" saves changes with a message.
4. **Branching**:

- git branch lists branches.
- git checkout -b <name> creates and switches to a new branch.

5. **Merging**:
   - git merge <branch> integrates changes from one branch into another.
6. **Remote Sync**:
   - git push uploads local commits to the remote repo.
   - git pull fetches and merges changes from the remote.
7. **History & Undo**:
   - git log, git diff, git reset, and git revert allow inspection and rollback of changes.
8. **Conflict Resolution**:
   - If changes in two branches overlap, Git flags a **merge conflict**, which must be manually resolved before continuing.

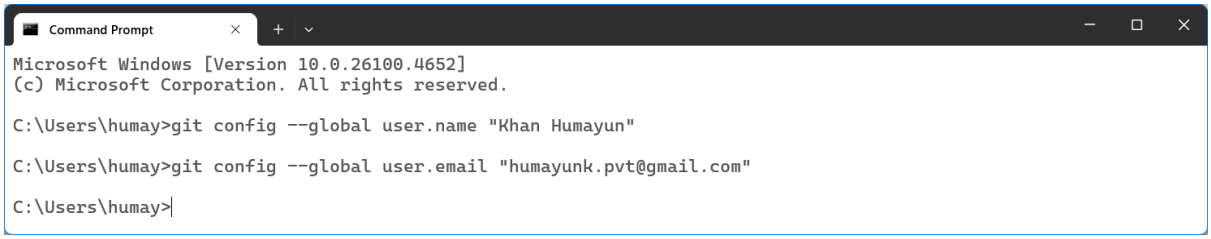
Git plays a **critical role** in DevOps pipelines where **automation, reproducibility, and rollback capabilities** are essential. Learning Git ensures developers and operations teams can collaborate effectively, resolve issues quickly, and deliver software reliably.

Procedure:

1. **Initial Git Setup**

   Set up user identity globally:

```
>> git config --global user.name "Khan Humayun"
>> git config --global user.email "humayunk.pvt@gmail.com"
```



2. **Clone Existing Repository**

   Use the repo created in Experiment 1 and clone it locally:

```
>> git clone https://github.com/HumayunK01/devops-prc1.git
>> cd devops-prc1
```

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

D:\>git clone https://github.com/HumayunK01/devops-prc1.git
Cloning into 'devops-prc1'...
remote: Enumerating objects: 301, done.
remote: Counting objects: 100% (301/301), done.
remote: Compressing objects: 100% (142/142), done.
remote: Total 301 (delta 157), reused 301 (delta 157), pack-reused 0 (from 0)
Receiving objects: 100% (301/301), 6.94 MiB | 2.49 MiB/s, done.
Resolving deltas: 100% (157/157), done.

D:\>cd devops-prc1

D:\devops-prc1>
```

3. Check Repository Status

Check the current status of files:

```
>> git status
```

```
C:\Windows\System32\cmd.e

D:\devops-prc1>git status
On branch main
Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean

D:\devops-prc1>
```

4. Track and Commit Changes

Stage all files and commit with a message:

```
>> git add .
>> git commit -m "Updated files after changes"
```

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

D:\devops-prc1>git add .

D:\devops-prc1>git commit -m "Updated files after changes"
On branch main
Your branch is up to date with 'origin/main'.

nothing to commit, working tree clean

D:\devops-prc1>
```

5. Create & Switch to a New Branch

Create a new branch and switch to it:

```
>> git checkout -b feature-branch
```

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

D:\devops-prc1>git checkout -b feature-branch
Switched to a new branch 'feature-branch'

D:\devops-prc1>
```

6. Make Edits and Merge Branch

Modify a file, commit it, then merge the branch:

```
>> git add .
>> git commit -m "Changes in feature branch"
>> git checkout main
>> git merge feature-branch
```

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

D:\devops-prc1>git add .

D:\devops-prc1>git commit -m "Changes in feature branch"
[feature-branch 41985ee] Changes in feature branch
 1 file changed, 1 insertion(+), 1 deletion(-)

D:\devops-prc1>git checkout main
Switched to branch 'main'
Your branch is up to date with 'origin/main'.

D:\devops-prc1>git merge feature-branch
Updating badcbe5..41985ee
Fast-forward
 README.md | 2 +-
 1 file changed, 1 insertion(+), 1 deletion(-)

D:\devops-prc1>
```

7. Push Changes to Remote Repo

Push the local changes to the online repository:

```
>> git push origin main
```

```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

D:\devops-prc1>git push origin main
Enumerating objects: 5, done.
Counting objects: 100% (5/5), done.
Delta compression using up to 12 threads
Compressing objects: 100% (3/3), done.
Writing objects: 100% (3/3), 323 bytes | 323.00 KiB/s, done.
Total 3 (delta 2), reused 0 (delta 0), pack-reused 0 (from 0)
remote: Resolving deltas: 100% (2/2), completed with 2 local objects.
To https://github.com/HumayunK01/devops-prc1.git
   badcbe5..41985ee  main -> main

D:\devops-prc1>
```

8. Pull Remote Changes

Fetch the latest changes from the remote repo:

```
>> git pull origin main
```

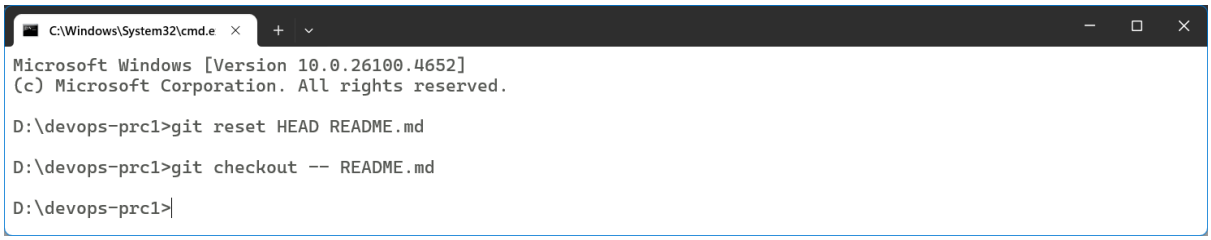
```
C:\Windows\System32\cmd.e
Microsoft Windows [Version 10.0.26100.4652]
(c) Microsoft Corporation. All rights reserved.

D:\devops-prc1>git pull origin main
From https://github.com/HumayunK01/devops-prc1
 * branch            main       -> FETCH_HEAD
Already up to date.
```

9. Undoing Changes (if required)

Unstage a file and discard local modifications:

```
>> git reset HEAD <filename>
>> git checkout -- <filename>
```



Output:

All commands were successfully executed. The cloned repository was modified, committed, merged, and pushed to the remote GitHub repository.

Conclusion:

By performing this experiment, we have developed a deeper understanding of using Git for real-world development workflows. This hands-on experience with Git commands has shown how version control systems enable teamwork, code reliability, and smooth project delivery in DevOps environments.