Prerequisites and Installation Guide for OpenFOAM with Docker

1 Introduction

This guide provides step-by-step instructions for setting up and running OpenFOAM with a custom solver (pimpleScalarsFoam) using Docker on different operating systems.

2 Prerequisites

Before starting, ensure you have:

- At least 20GB of free disk space
- At least 8GB RAM recommended
- Internet connection for downloading Docker and OpenFOAM images

3 Linux Installation

3.1 Install Docker

```
# Update package index
sudo apt-get update

# Install prerequisites
sudo apt-get install -y \
    apt-transport-https \
    ca-certificates \
    curl \
    gnupg \
    lsb-release

# Add Docker's official GPG key
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo gpg --dearmor -o
    /usr/share/keyrings/docker-archive-keyring.gpg

# Set up stable repository
echo \
"deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/docker-
    archive-keyring.gpg] https://download.docker.com/linux/ubuntu \
$(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev
    /null

# Install Docker Engine
sudo apt-get update
sudo apt-get install -y docker-ce docker-ce-cli containerd.io

# Add your user to docker group (requires logout/login to take effect)
sudo usermod -aG docker $USER

# Verify installation
docker --version
```

3.2 Run OpenFOAM

```
# Start container
docker run -it \
    --name cfd1_container \
    -v $(pwd):/data \
    opencfd/openfoam-default /bin/bash

# Inside container, download and run setup script
wget https://raw.githubusercontent.com/Nausheen13/cedar-course/main/
    setup_openfoam.sh
chmod +x setup_openfoam.sh
./setup_openfoam.sh

# Switch to foam user and run
su - foam
. /opt/openfoam/openfoam2306/etc/bashrc
cd /data/cedar-course/mefe-swakless
pimpleScalarsFoam
```

4 Windows Installation

4.1 Install WSL2 (Windows Subsystem for Linux)

1. Open PowerShell as Administrator and run:

```
wsl --install

```

2. Restart your computer
3. Open Ubuntu from Start menu and set up your username/password

4.2 Install Docker Desktop

1. Download Docker Desktop from Docker Hub
2. Run the installer (requires admin privileges)
3. During installation, ensure "Use WSL 2 instead of Hyper-V" is selected
4. Start Docker Desktop and complete the tutorial

4.3 Run OpenFOAM

Open Ubuntu terminal (from Start menu) and follow the same commands as Linux section above.

5 macOS Installation

5.1 Install Docker Desktop

1. Download Docker Desktop for Mac from Docker Hub
2. Drag Docker to Applications folder
3. Start Docker Desktop and complete the tutorial

5.2 Run OpenFOAM

Open Terminal and run the same commands as Linux section.

6 Common Issues and Solutions

6.1 Docker Permission Issues

```
# If you get permission denied errors
sudo usermod -aG docker $USER
# Then log out and log back in
```

6.2 WSL2 Memory Issues (Windows)

Create .wslconfig file in your Windows user directory:

```
[wsl2]
memory=8GB
processors=4
```

6.3 Volume Mount Issues

- Ensure you're in the correct directory when running Docker
- On Windows, use proper path conversion for WSL
- On macOS, ensure the directory is shared in Docker Desktop preferences

7 Verification

To verify everything is working:

```
# Check Docker installation
docker --version

# Check OpenFOAM
pimpleScalarsFoam -help

# Check case setup
ls -l /data/cedar-course/mefe-swakless
```

8 Additional Resources

- Docker Documentation: `https://docs.docker.com/`
- OpenFOAM Documentation: `https://www.openfoam.com/documentation/`
- WSL2 Documentation: `https://docs.microsoft.com/en-us/windows/wsl/`
- GitHub Repository: `https://github.com/Nausheen13/cedar-course`