Docker Deployment Project Report

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Date: December 6, 2025

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1 Part 1: Understanding Environment Inconsistency

1.1 Step 1: Installing Node.js 16

First, we need to uninstall any existing Node.js versions and install Node.js 16 to simulate a production server environment.

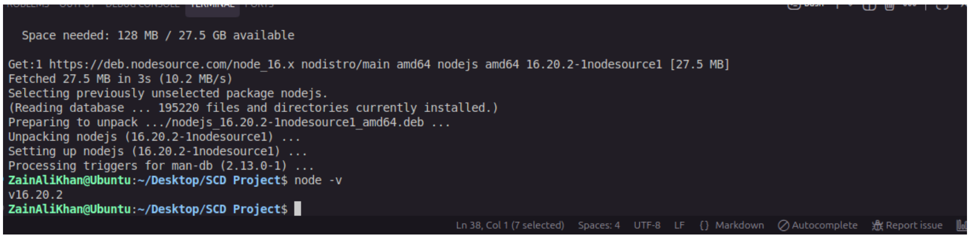
1.1.1 Commands Executed:

```
# Remove existing Node.js installations
sudo apt remove -y nodejs npm
sudo apt autoremove -y

# Update package index
sudo apt update

# Install required dependencies
sudo apt install -y curl

# Add Node.js 16.x from NodeSource
curl -fsSL https://deb.nodesource.com/setup_16.x | sudo -E bash -

# Install Node.js
sudo apt install -y nodejs
```

1.2 Step 2: Verify Node.js 16 Installation

```
node -v
npm -v
```

SCREENSHOT 1: Node.js Version Verification



```
  Space needed: 128 MB / 27.5 GB available

Get:1 https://deb.nodesource.com/node_16.x nodistro/main amd64 nodejs amd64 16.20.2-1nodesource1 [27.5 MB]
Fetched 27.5 MB in 3s (10.2 MB/s)
Selecting previously unselected package nodejs.
(Reading database ... 195220 files and directories currently installed.)
Preparing to unpack .../nodejs_16.20.2-1nodesource1_amd64.deb ...
Unpacking nodejs (16.20.2-1nodesource1) ...
Setting up nodejs (16.20.2-1nodesource1) ...
Processing triggers for man-db (2.13.0-1) ...
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$ node -v
v16.20.2
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$ 
```

Figure 1: Node.js Version Verification

1.3 Step 3: Clone and Run the Node.js Application

Now we will clone the repository from GitHub and attempt to run it on our Node.js 16 server environment.

1.3.1 Commands Executed:

```
# Create a working directory
mkdir -p ~/docker-assignment
cd ~/docker-assignment

# Clone the repository
git clone https://github.com/LaibaImran1500/SCD-25-NodeApp.git

# Navigate to the project directory
cd SCD-25-NodeApp

# View project structure
ls -la

# Check package.json for dependencies and node version
   requirements
cat package.json

# Install dependencies
npm install

# Run the application
npm start
```

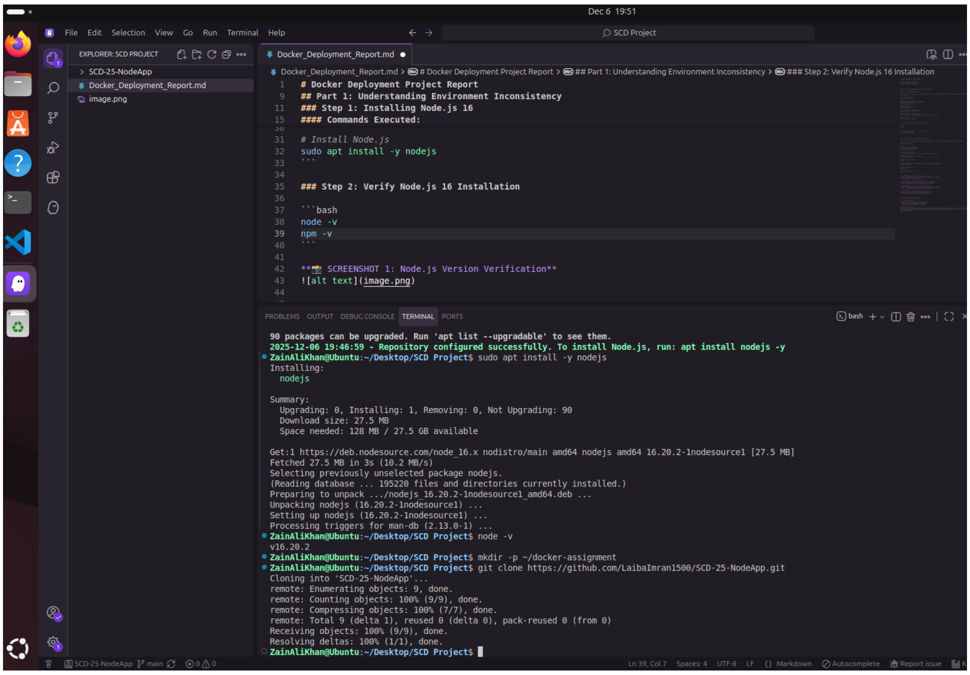
SCREENSHOT 2: Cloning the Repository
SCREENSHOT 3: Package.json Contents

1.3.2 Step 3.1: Install Dependencies

```
npm install
```

npm install Output - Version Warnings:

```
npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: ’body-parser@2.2.1’,
npm WARN EBADENGINE   required: { node: ’>=18’ },
npm WARN EBADENGINE   current: { node: ’v16.20.2’, npm: ’8.19.4’ }
npm WARN EBADENGINE }
npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: ’express@5.2.1’,
npm WARN EBADENGINE   required: { node: ’>= 18’ },
npm WARN EBADENGINE   current: { node: ’v16.20.2’, npm: ’8.19.4’ }
npm WARN EBADENGINE }
npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: ’finalhandler@2.1.1’,
npm WARN EBADENGINE   required: { node: ’>= 18.0.0’ },
```



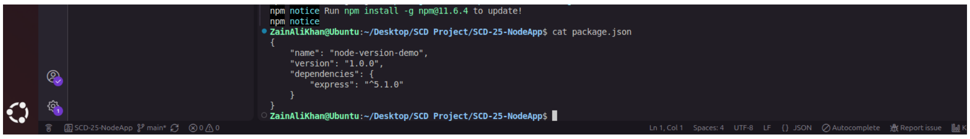
```
# Docker Deployment Project Report
## Part 1: Understanding Environment Inconsistency
### Step 1: Installing Node.js 16
#### Commands Executed:

# Install Node.js
sudo apt install -y nodejs
```

Step 2: Verify Node.js 16 Installation

```bash
node -v
npm -v
```

📸 SCREENSHOT 1: Node.js Version Verification
![alt text](image.png)
```

```
90 packages can be upgraded. Run 'apt list --upgradable' to see them.
2025-12-06 19:46:59 - Repository configured successfully. To install Node.js, run: apt install nodejs -y
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$ sudo apt install -y nodejs
Installing:
  nodejs

Summary:
  Upgrading: 0, Installing: 1, Removing: 0, Not Upgrading: 90
  Download size: 27.5 MB
  Space needed: 128 MB / 27.5 GB available

Get:1 https://deb.nodesource.com/node_16.x nodistro/main amd64 nodejs amd64 16.20.2-1nodesource1 [27.5 MB]
Fetched 27.5 MB in 3s (10.2 MB/s)
Selecting previously unselected package nodejs.
(Reading database ... 195220 files and directories currently installed.)
Preparing to unpack .../nodejs_16.20.2-1nodesource1_amd64.deb ...
Unpacking nodejs (16.20.2-1nodesource1) ...
Setting up nodejs (16.20.2-1nodesource1) ...
Processing triggers for man-db (2.13.0-1) ...
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$ node -v
v16.20.2
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$ mkdir -p ~/docker-assignment
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$ git clone https://github.com/LaibaImran1500/SCD-25-NodeApp.git
Cloning into 'SCD-25-NodeApp'...
remote: Enumerating objects: 9, done.
remote: Counting objects: 100% (9/9), done.
remote: Compressing objects: 100% (7/7), done.
remote: Total 9 (delta 1), reused 0 (delta 0), pack-reused 0 (from 0)
Receiving objects: 100% (9/9), done.
Resolving deltas: 100% (1/1), done.
ZainAliKhan@Ubuntu:~/Desktop/SCD Project$
```

Figure 2: Cloning the Repository


SCD-25-NodeApp
main*
Ln 1, Col 1
Spaces: 4
UTF-8
LF
JSON
Autocomplete
Report issue

```
npm notice Run npm install -g npm@11.6.4 to update!
npm notice
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ cat package.json
{
    "name": "node-version-demo",
    "version": "1.0.0",
    "dependencies": {
        "express": "^5.1.0"
    }
}
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$
```

Figure 3: Package.json Contents
```

```
npm WARN EBADENGINE   current: { node: ’v16.20.2’, npm: ’8.19.4’ }
npm WARN EBADENGINE }
npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: ’router@2.2.0’,
npm WARN EBADENGINE   required: { node: ’>= 18’ },
npm WARN EBADENGINE   current: { node: ’v16.20.2’, npm: ’8.19.4’ }
npm WARN EBADENGINE }
npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: ’send@1.2.0’,
npm WARN EBADENGINE   required: { node: ’>= 18’ },
npm WARN EBADENGINE   current: { node: ’v16.20.2’, npm: ’8.19.4’ }
npm WARN EBADENGINE }
npm WARN EBADENGINE Unsupported engine {
npm WARN EBADENGINE   package: ’serve-static@2.2.0’,
npm WARN EBADENGINE   required: { node: ’>= 18’ },
npm WARN EBADENGINE   current: { node: ’v16.20.2’, npm: ’8.19.4’ }
npm WARN EBADENGINE }
```

SCREENSHOT 4: npm install Warnings

- Take a screenshot showing the npm install warnings about unsupported engine
- These warnings clearly show Node.js 18+ is required but we have Node.js 16

1.3.3 Step 3.2: Run the Application

```
node app.js
```

Server Output:

```
Server is running on http://localhost:3000
```

The server starts, but when we test the endpoint...

1.3.4 Step 3.3: Test the Backend Endpoint

```
curl http://localhost:3000/todo/1
```

Response:

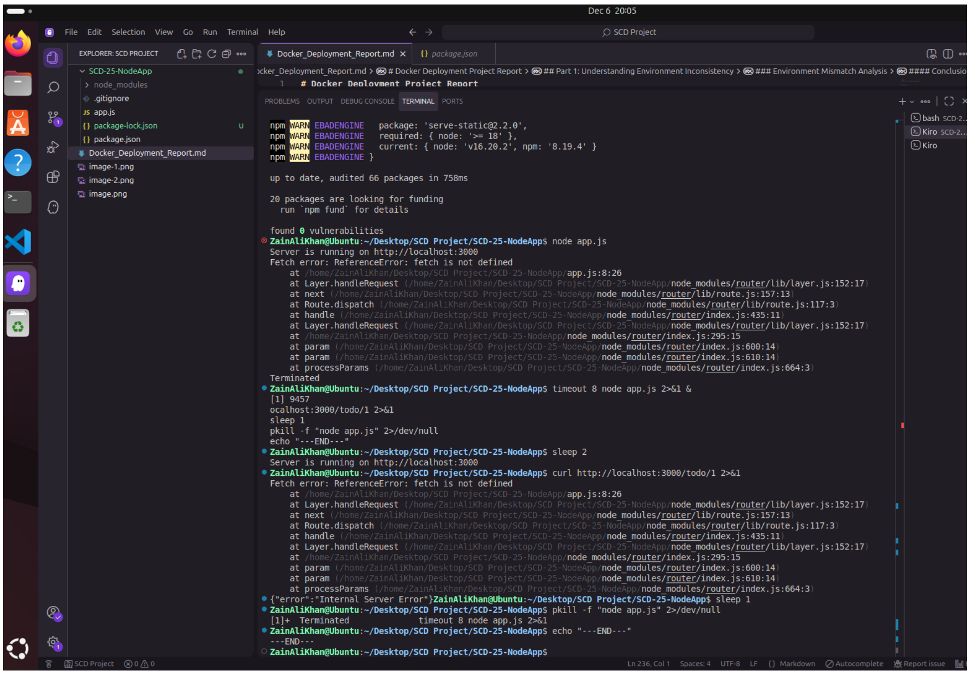
```
{"error":"Internal Server Error"}
```

Server Console Error:

```
Fetch error: ReferenceError: fetch is not defined
    at /home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/app.js
       :8:26
    at Layer.handleRequest (/home/ZainAliKhan/Desktop/SCD Project/
      SCD-25-NodeApp/node_modules/router/lib/layer.js:152:17)
    at next (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/
      node_modules/router/lib/route.js:157:13)
    at Route.dispatch (/home/ZainAliKhan/Desktop/SCD Project/
      SCD-25-NodeApp/node_modules/router/lib/route.js:117:3)
```

SCREENSHOT 5: Application Runtime Error

- Take a screenshot showing:
  1. The server starting (`Server is running on http://localhost:3000`)
  2. The curl command and response (`{"error":"Internal Server Error"}`)
  3. The error in server console: `ReferenceError: fetch is not defined`



```
npm WARN EBADENGINE   package: 'serve-static@2.2.0',
npm WARN EBADENGINE   required: { node: '>= 18' },
npm WARN EBADENGINE   current: { node: 'v16.20.2', npm: '8.19.4' }
npm WARN EBADENGINE }

up to date, audited 66 packages in 758ms

20 packages are looking for funding
  run `npm fund` for details

found 0 vulnerabilities
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ node app.js
Server is running on http://localhost:3000
Fetch error: ReferenceError: fetch is not defined
    at /home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/app.js:8:26
    at Layer.handleRequest (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/layer.js:152:17)
    at next (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/route.js:157:13)
    at Route.dispatch (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/route.js:117:3)
    at handle (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:435:11)
    at Layer.handleRequest (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/layer.js:152:17)
    at /home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:295:15
    at param (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:600:14)
    at param (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:610:14)
    at processParams (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:664:3)
Terminated
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ timeout 8 node app.js 2>&1 &
[1] 9457
ocalhost:3000/todo/1 2>&1
sleep 1
pkill -f "node app.js" 2>/dev/null
echo "---END---"
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ sleep 2
Server is running on http://localhost:3000
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ curl http://localhost:3000/todo/1 2>&1
Fetch error: ReferenceError: fetch is not defined
    at /home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/app.js:8:26
    at Layer.handleRequest (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/layer.js:152:17)
    at next (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/route.js:157:13)
    at Route.dispatch (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/route.js:117:3)
    at handle (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:435:11)
    at Layer.handleRequest (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/layer.js:152:17)
    at /home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:295:15
    at param (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:600:14)
    at param (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:610:14)
    at processParams (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:664:3)
{"error":"Internal Server Error"}ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ sleep 1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ pkill -f "node app.js" 2>/dev/null
[1]+  Terminated              timeout 8 node app.js 2>&1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ echo "---END---"
---END---
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$
```

Figure 4: Application Runtime Error

1.4 Environment Mismatch Analysis

1.4.1 Issues Encountered:

1. **npm install Warnings - Unsupported Engine:**
   - Multiple packages require Node.js 18+
   - Express 5.2.1 requires `node >= 18`
   - body-parser, router, send, serve-static all require Node.js 18+
   - Our server has Node.js v16.20.2
2. **Runtime Error - fetch is not defined:**
   - The application uses native `fetch()` API in app.js line 8
   - Native `fetch()` was introduced in Node.js 18 (experimental) and stable in Node.js 21

- Node.js 16 does NOT have native `fetch()` support
- **Error:** `ReferenceError: fetch is not defined`

3. **Version Mismatch Summary:**

Component	Required Version	Server Version	Status
Node.js	>= 18	v16.20.2	Incompatible
Express	5.2.1	-	Requires Node 18+
fetch() API	Node 18+	Not available	Not supported
body-parser	2.2.1	-	Requires Node 18+
router	2.2.0	-	Requires Node 18+

Table 1: Version Mismatch Summary

1.4.2 How Environment Mismatch Prevents Proper Deployment:

1. **Development vs Production Environment Gap:**
   - The developer built this application using Node.js 18+ where `fetch()` is natively available
   - The production server runs Node.js 16 which lacks this feature
   - The application compiles but fails at runtime when the fetch() function is called
2. **No Explicit Version Requirements in package.json:**
   - The package.json does not specify an "engines" field
   - This makes it difficult to identify compatibility issues before deployment
   - npm only shows warnings, not errors, allowing installation to proceed
3. **Modern JavaScript Features Not Backward Compatible:**
   - The code uses modern features (native fetch) that don't exist in older Node versions
   - Without containerization, we cannot run different Node.js versions for different applications on the same server
4. **Server Environment Constraints:**
   - We cannot upgrade Node.js on the server as other applications depend on Node.js 16
   - We cannot modify the source code as that is the developer's responsibility

1.4.3 Conclusion:

As a production engineer, we CANNOT:

- Modify the source code (developer's responsibility)
- Upgrade Node.js on the server (would break other applications)

The application fails to run properly due to Node.js version incompatibility. We need a solution that allows running this application with its required Node.js version (18+) without affecting other applications on the server that depend on Node.js 16.

Solution: Docker Containerization - This will be addressed in Part 2.

---

2 Part 2: Solving with Docker Containers

2.1 Identifying the Right Node.js Version

2.1.1 Analysis:

Based on the errors encountered in Part 1, we need to identify the correct Node.js version:

1. **Express 5.x Requirements:**
   - Express 5.2.1 requires `node >= 18`
   - Reference: https://expressjs.com/en/guide/migrating-5.html
2. **Native fetch() API Requirements:**
   - The `fetch()` API was added as experimental in Node.js 18
   - It became stable in Node.js 21
   - Reference: https://nodejs.org/docs/latest-v18.x/api/globals.html#fetch
3. **Package Dependencies:**
   - body-parser@2.2.1 requires `node >= 18`
   - router@2.2.0 requires `node >= 18`
   - All other dependencies also require Node.js 18+

2.1.2 Justification for Node.js 18:

Selected Version: Node.js 18 (LTS - Alpine)

References:

- Express 5.x Migration Guide: https://expressjs.com/en/guide/migrating-5.html
- Node.js 18 Release Notes: https://nodejs.org/en/blog/release/v18.0.0
- Node.js fetch() Documentation: https://nodejs.org/docs/latest-v18.x/api/globals.html#fetch

---

Reason	Explanation
Express 5.x Support	Express 5.2.1 officially requires Node.js 18+
Native fetch()	fetch() API is available natively in Node.js 18+
LTS Version	Node.js 18 is an LTS (Long Term Support) version, ensuring stability
Dependency Compatibility	All npm packages in this project require Node.js 18+

Table 2: Justification for Node.js 18

2.2 Dockerfile

The following Dockerfile containerizes the Node.js application with the correct Node.js version:

```
# Use Node.js 18 Alpine as base image (LTS version with native fetch support)
FROM node:18-alpine

# Set working directory inside container
WORKDIR /app

# Copy package files first (for better caching)
COPY package*.json ./

# Install dependencies
RUN npm install

# Copy application source code
COPY . .

# Expose the application port
EXPOSE 3000

# Command to run the application
CMD ["node", "app.js"]
```

2.3 Step 1: Create the Dockerfile

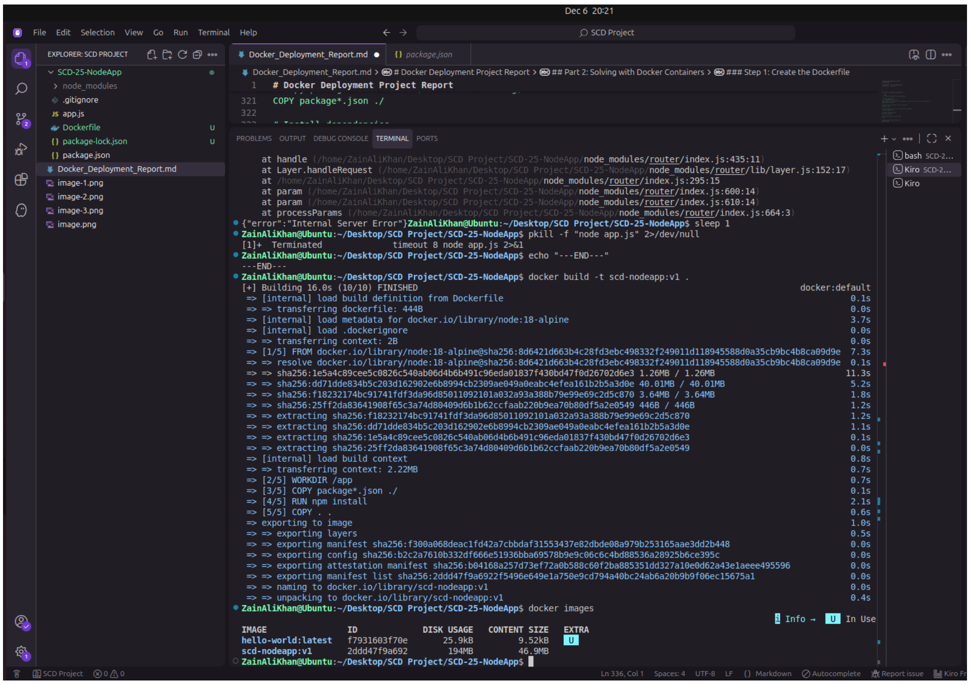
```
cd ~/docker-assignment/SCD-25-NodeApp

# Create Dockerfile
cat > Dockerfile << 'EOF'
# Use Node.js 18 Alpine as base image (LTS version with native fetch support)
FROM node:18-alpine

# Set working directory inside container
```

```
WORKDIR /app

# Copy package files first (for better caching)
COPY package*.json ./

# Install dependencies
RUN npm install

# Copy application source code
COPY . .

# Expose the application port
EXPOSE 3000

# Command to run the application
CMD ["node", "app.js"]
EOF
```

2.4 Step 2: Build the Docker Image

```
# Build the Docker image
docker build -t scd-nodeapp:v1 .
```

SCREENSHOT 7: Docker Build Process



```
# Docker Deployment Project Report
COPY package*.json ./
```

```
    at handle (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:435:11)
    at Layer.handleRequest (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/lib/layer.js:152:17)
    at /home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:295:15
    at param (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:600:14)
    at param (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:610:14)
    at processParams (/home/ZainAliKhan/Desktop/SCD Project/SCD-25-NodeApp/node_modules/router/index.js:664:3)
{"error":"Internal Server Error"}ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ sleep 1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ pkill -f "node app.js" 2>/dev/null
[1]+  Terminated              timeout 8 node app.js 2>&1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ echo "---END---"
---END---
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker build -t scd-nodeapp:v1 .
[+] Building 16.0s (10/10) FINISHED                                                                docker:default
 => [internal] load build definition from Dockerfile                                                          0.1s
 => => transferring dockerfile: 444B                                                                          0.0s
 => [internal] load metadata for docker.io/library/node:18-alpine                                             3.7s
 => [internal] load .dockerignore                                                                             0.0s
 => => transferring context: 2B                                                                               0.0s
 => [1/5] FROM docker.io/library/node:18-alpine@sha256:8d6421d663b4c28fd3ebc498332f249011d118945588d0a35cb9bc4b8ca09d9e  7.3s
 => => resolve docker.io/library/node:18-alpine@sha256:8d6421d663b4c28fd3ebc498332f249011d118945588d0a35cb9bc4b8ca09d9e  0.1s
 => => sha256:1e5a4c89cee5c0826c540ab06d4b6b491c96eda01837f430bd47f0d26702d6e3 1.26MB / 1.26MB                11.3s
 => => sha256:dd71dde834b5c203d162902e6b8994cb2309ae049a0eabc4efea161b2b5a3d0e 40.01MB / 40.01MB               5.2s
 => => sha256:f18232174bc91741fdf3da96d85011092101a032a93a388b79e99e69c2d5c870 3.64MB / 3.64MB                 1.8s
 => => sha256:25ff2da83641908f65c3a74d80409d6b1b62ccfaab220b9ea70b80df5a2e0549 446B / 446B                     1.2s
 => => extracting sha256:f18232174bc91741fdf3da96d85011092101a032a93a388b79e99e69c2d5c870                      1.2s
 => => extracting sha256:dd71dde834b5c203d162902e6b8994cb2309ae049a0eabc4efea161b2b5a3d0e                      1.1s
 => => extracting sha256:1e5a4c89cee5c0826c540ab06d4b6b491c96eda01837f430bd47f0d26702d6e3                      0.1s
 => => extracting sha256:25ff2da83641908f65c3a74d80409d6b1b62ccfaab220b9ea70b80df5a2e0549                      0.0s
 => [internal] load build context                                                                             0.8s
 => => transferring context: 2.22MB                                                                          0.7s
 => [2/5] WORKDIR /app                                                                                        0.7s
 => [3/5] COPY package*.json ./                                                                               0.1s
 => [4/5] RUN npm install                                                                                     2.1s
 => [5/5] COPY . .                                                                                            0.6s
 => exporting to image                                                                                        1.0s
 => => exporting layers                                                                                       0.5s
 => => exporting manifest sha256:f300a068deac1fd42a7cbbdaf31553437e82dbde08a979b253165aae3dd2b448             0.0s
 => => exporting config sha256:b2c2a7610b332df666e51936bba69578b9e9c06c6c4bd88536a28925b6ce395c               0.0s
 => => exporting attestation manifest sha256:b04168a257d73ef72a0b588c60f2ba885351dd327a10e0d62a43e1aeee495596  0.0s
 => => exporting manifest list sha256:2ddd47f9a6922f5496e649e1a750e9cd794a40bc24ab6a20b9b9f06ec15675a1        0.0s
 => => naming to docker.io/library/scd-nodeapp:v1                                                             0.0s
 => => unpacking to docker.io/library/scd-nodeapp:v1                                                          0.4s
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker images
                                                                                            i Info →  U In Use
IMAGE               ID             DISK USAGE   CONTENT SIZE   EXTRA
hello-world:latest  f7931603f70e       25.9kB         9.52kB    U
scd-nodeapp:v1      2ddd47f9a692        194MB         46.9MB
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$
```

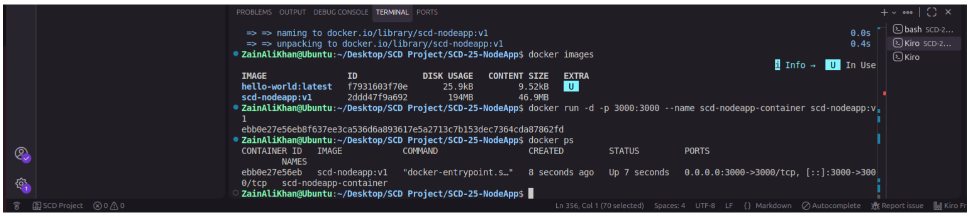
Docker_Deployment_Report.md
package.json
Docker_Deployment_Report.md > # Docker Deployment Project Report > ## Part 2: Solving with Docker Containers > ### Step 1: Create the Dockerfile
PROBLEMS
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Ln 336, Col 1
Spaces: 4
UTF-8
LF
Markdown
Autocomplete

Figure 5: Docker Build Process

2.5 Step 3: Run the Docker Container Locally

```
# Run the container
docker run -d -p 3000:3000 --name scd-nodeapp-container scd-
   nodeapp:v1

# Check if container is running
docker ps
```

SCREENSHOT 8: Container Running



```
 => => naming to docker.io/library/scd-nodeapp:v1                                          0.0s
 => => unpacking to docker.io/library/scd-nodeapp:v1                                       0.4s
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker images
                                                                          i Info →  U  In Use
IMAGE                ID             DISK USAGE   CONTENT SIZE   EXTRA
hello-world:latest   f7931603f70e       25.9kB         9.52kB    U
scd-nodeapp:v1       2ddd47f9a692        194MB         46.9MB
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker run -d -p 3000:3000 --name scd-nodeapp-container scd-nodeapp:v
1
ebb0e27e56eb8f637ee3ca536d6a893617e5a2713c7b153dec7364cda87862fd
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker ps
CONTAINER ID   IMAGE            COMMAND                  CREATED         STATUS         PORTS
       NAMES
ebb0e27e56eb   scd-nodeapp:v1   "docker-entrypoint.s…"   8 seconds ago   Up 7 seconds   0.0.0.0:3000->3000/tcp, [::]:3000->300
0/tcp   scd-nodeapp-container
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ 
```

Figure 6: Container Running

2.6 Step 4: Test the Application in Container

```
# Test the endpoint
curl http://localhost:3000/todo/1
```

Expected Response:

```
{
  "userId": 1,
  "id": 1,
  "title": "delectus aut autem",
  "completed": false
}
```

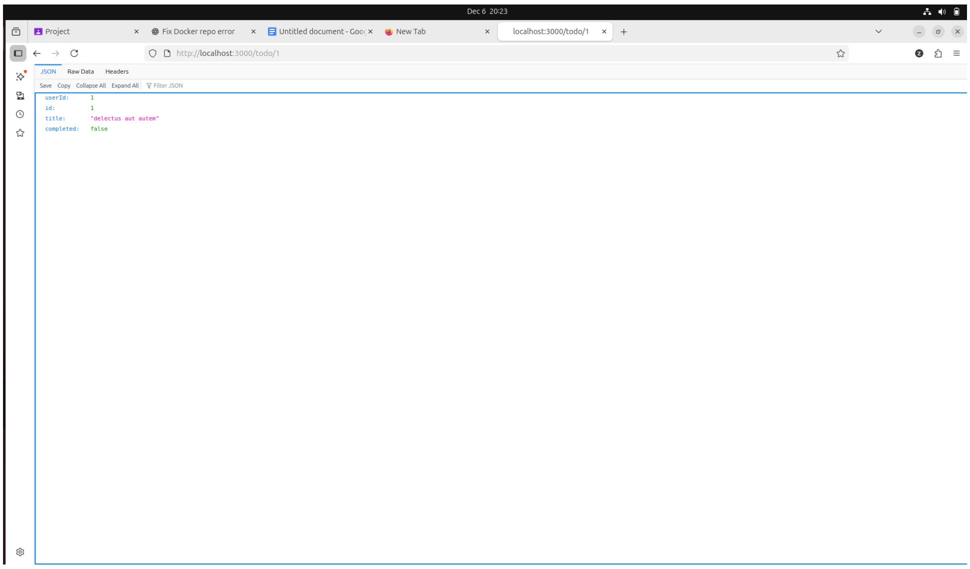
SCREENSHOT 9: Successful API Response

2.7 Step 5: View Container Logs

```
# View container logs
docker logs scd-nodeapp-container
```

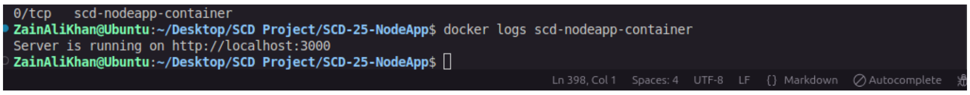
SCREENSHOT 10: Container Logs

2.8 Step 6: Publish Docker Image to Docker Hub



```
userId:     1
id:         1
title:      "delectus aut autem"
completed:  false
```

Figure 7: Successful API Response



```
0/tcp   scd-nodeapp-container
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker logs scd-nodeapp-container
Server is running on http://localhost:3000
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ 
```

Figure 8: Container Logs

```
# Login to Docker Hub
docker login

# Tag the image for Docker Hub
docker tag scd-nodeapp:v1 zainalik157/scd-nodeapp:v1

# Push the image to Docker Hub
docker push zainalik157/scd-nodeapp:v1
```

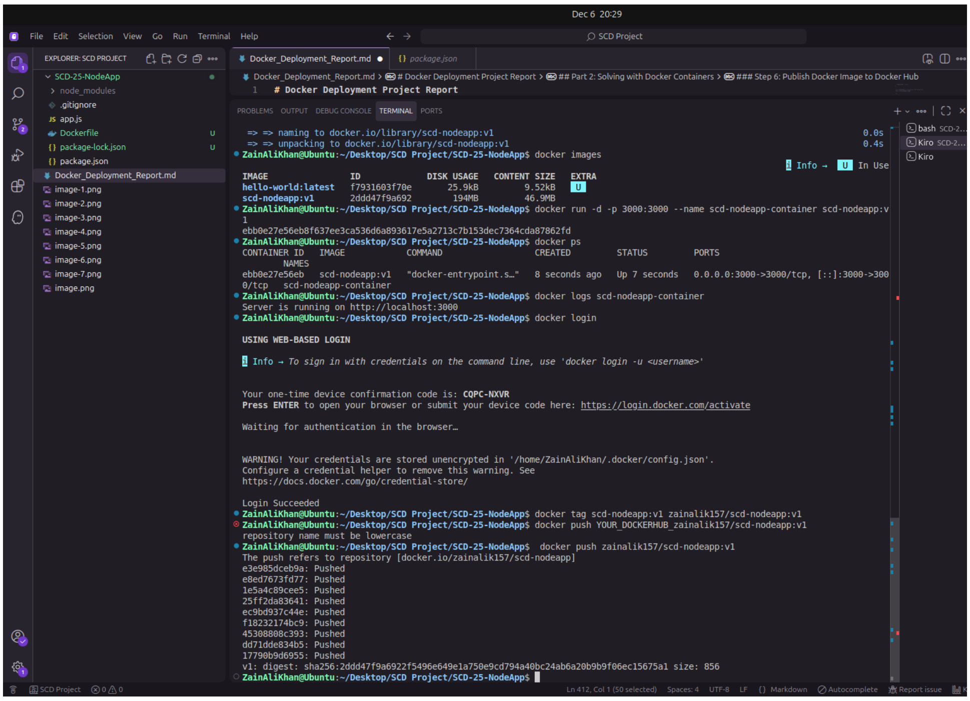
SCREENSHOT 11: Docker Push to Hub
Docker Hub URL: https://hub.docker.com/r/zainalik157/scd-nodeapp

---

2.9 Step 7: Run on Server Environment

```
# Stop and remove local container first
docker stop scd-nodeapp-container
docker rm scd-nodeapp-container

# Pull and run from Docker Hub (simulating server deployment)
docker pull zainalik157/scd-nodeapp:v1
docker run -d -p 3000:3000 --name scd-nodeapp-container
   zainalik157/scd-nodeapp:v1
```

SCREENSHOT 12: Container Running on Server

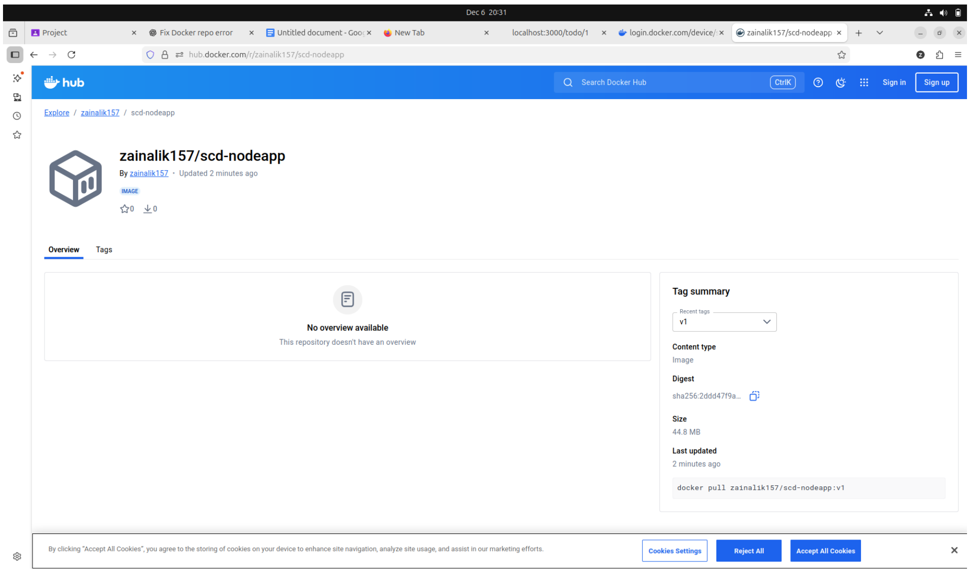


Dec 6 20:29
File Edit Selection View Go Run Terminal Help
SCD Project
EXPLORER: SCD PROJECT
SCD-25-NodeApp
node_modules
.gitignore
app.js
Dockerfile
package-lock.json
package.json
Docker_Deployment_Report.md
image-1.png
image-2.png
image-3.png
image-4.png
image-5.png
image-6.png
image-7.png
image.png
Docker_Deployment_Report.md
package.json
Docker_Deployment_Report.md > # Docker Deployment Project Report > ## Part 2: Solving with Docker Containers > ### Step 6: Publish Docker Image to Docker Hub
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
bash SCD-2...
Kiro SCD-2...
Kiro
Ln 412, Col 1 (50 selected) Spaces: 4 UTF-8 LF {} Markdown Autocomplete Report issue

```
# Docker Deployment Project Report
```

```
 => => naming to docker.io/library/scd-nodeapp:v1                                                  0.0s
 => => unpacking to docker.io/library/scd-nodeapp:v1                                               0.4s
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker images
                                                                                    i Info →  U In Use
IMAGE               ID             DISK USAGE   CONTENT SIZE   EXTRA
hello-world:latest  f7931603f70e       25.9kB         9.52kB    U
scd-nodeapp:v1      2ddd47f9a692        194MB         46.9MB
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker run -d -p 3000:3000 --name scd-nodeapp-container scd-nodeapp:v
1
ebb0e27e56eb8f637ee3ca536d6a893617e5a2713c7b153dec7364cda87862fd
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker ps
CONTAINER ID   IMAGE            COMMAND                  CREATED         STATUS         PORTS
      NAMES
ebb0e27e56eb   scd-nodeapp:v1   "docker-entrypoint.s…"   8 seconds ago   Up 7 seconds   0.0.0.0:3000->3000/tcp, [::]:3000->300
0/tcp   scd-nodeapp-container
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker logs scd-nodeapp-container
Server is running on http://localhost:3000
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker login

USING WEB-BASED LOGIN

i Info → To sign in with credentials on the command line, use 'docker login -u <username>'


Your one-time device confirmation code is: CQPC-NXVR
Press ENTER to open your browser or submit your device code here: https://login.docker.com/activate

Waiting for authentication in the browser…


WARNING! Your credentials are stored unencrypted in '/home/ZainAliKhan/.docker/config.json'.
Configure a credential helper to remove this warning. See
https://docs.docker.com/go/credential-store/

Login Succeeded
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker tag scd-nodeapp:v1 zainalik157/scd-nodeapp:v1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker push YOUR_DOCKERHUB_zainalik157/scd-nodeapp:v1
repository name must be lowercase
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$  docker push zainalik157/scd-nodeapp:v1
The push refers to repository [docker.io/zainalik157/scd-nodeapp]
e3e985dceb9a: Pushed
e8ed7673fd77: Pushed
1e5a4c89cee5: Pushed
25ff2da83641: Pushed
ec9bd937c44e: Pushed
f18232174bc9: Pushed
45308808c393: Pushed
dd71dde834b5: Pushed
17790b9d6955: Pushed
v1: digest: sha256:2ddd47f9a6922f5496e649e1a750e9cd794a40bc24ab6a20b9b9f06ec15675a1 size: 856
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ 
```

Figure 9: Docker Push to Hub



Explore / zainalik157 / scd-nodeapp

zainalik157/scd-nodeapp

By zainalik157 • Updated 2 minutes ago

IMAGE

☆0 ⤓0

No overview available

This repository doesn't have an overview

Tag summary

Recent tags: v1

Content type: Image

Digest: sha256:2ddd47f9a...

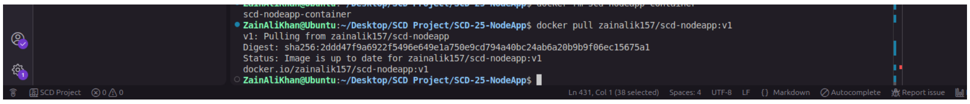
Size: 44.8 MB

Last updated: 2 minutes ago

```
docker pull zainalik157/scd-nodeapp:v1
```

By clicking "Accept All Cookies", you agree to the storing of cookies on your device to enhance site navigation, analyze site usage, and assist in our marketing efforts.

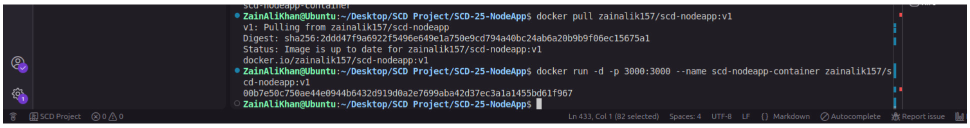
Figure 10: Docker Hub Repository



SCD Project
Ln 431, Col 1 (38 selected) Spaces: 4 UTF-8 LF {} Markdown Autocomplete Report issue

```
scd-nodeapp-container
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker pull zainalik157/scd-nodeapp:v1
v1: Pulling from zainalik157/scd-nodeapp
Digest: sha256:2ddd47f9a6922f5496e649e1a750e9cd794a40bc24ab6a20b9b9f06ec15675a1
Status: Image is up to date for zainalik157/scd-nodeapp:v1
docker.io/zainalik157/scd-nodeapp:v1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ 
```

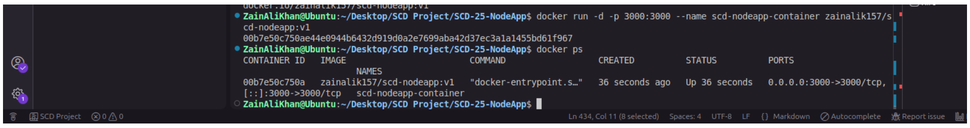
Figure 11: Docker Pull



SCD Project
Ln 433, Col 1 (82 selected) Spaces: 4 UTF-8 LF {} Markdown Autocomplete Report issue

```
scd-nodeapp-container
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker pull zainalik157/scd-nodeapp:v1
v1: Pulling from zainalik157/scd-nodeapp
Digest: sha256:2ddd47f9a6922f5496e649e1a750e9cd794a40bc24ab6a20b9b9f06ec15675a1
Status: Image is up to date for zainalik157/scd-nodeapp:v1
docker.io/zainalik157/scd-nodeapp:v1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker run -d -p 3000:3000 --name scd-nodeapp-container zainalik157/s
cd-nodeapp:v1
00b7e50c750ae44e0944b6432d919d0a2e7699aba42d37ec3a1a1455bd61f967
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ 
```

Figure 12: Docker Run from Hub



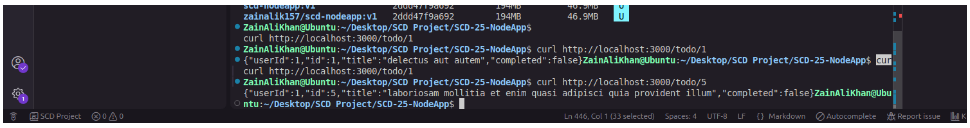
```
docker.io/zainalik157/scd-nodeapp:v1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker run -d -p 3000:3000 --name scd-nodeapp-container zainalik157/s
cd-nodeapp:v1
00b7e50c750ae44e0944b6432d919d0a2e7699aba42d37ec3a1a1455bd61f967
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ docker ps
CONTAINER ID   IMAGE                      COMMAND                  CREATED          STATUS          PORTS
                NAMES
00b7e50c750a   zainalik157/scd-nodeapp:v1   "docker-entrypoint.s…"   36 seconds ago   Up 36 seconds   0.0.0.0:3000->3000/tcp,
[::]:3000->3000/tcp   scd-nodeapp-container
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$
```

SCD Project
Ln 434, Col 11 (8 selected)   Spaces: 4   UTF-8   LF   {} Markdown   Autocomplete   Report issue

Figure 13: Container Running on Server

2.10 Step 8: Test Backend Service in Container

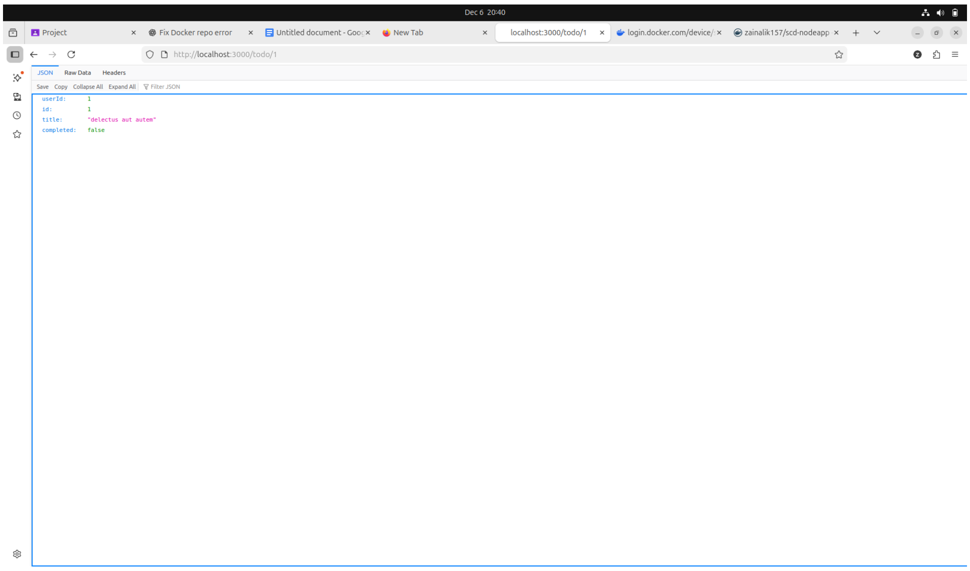
SCREENSHOT 13: Final Testing



```
scd-nodeapp:v1                2ddd47f9a692   194MB   46.9MB   U
zainalik157/scd-nodeapp:v1    2ddd47f9a692   194MB   46.9MB   U
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$
curl http://localhost:3000/todo/1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ curl http://localhost:3000/todo/1
{"userId":1,"id":1,"title":"delectus aut autem","completed":false}ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ cur
curl http://localhost:3000/todo/1
ZainAliKhan@Ubuntu:~/Desktop/SCD Project/SCD-25-NodeApp$ curl http://localhost:3000/todo/5
{"userId":1,"id":5,"title":"laboriosam mollitia et enim quasi adipisci quia provident illum","completed":false}ZainAliKhan@Ubu
ntu:~/Desktop/SCD Project/SCD-25-NodeApp$
```

SCD Project
Ln 446, Col 1 (33 selected)   Spaces: 4   UTF-8   LF   {} Markdown   Autocomplete   Report issue

Figure 14: Final Testing - Part 1



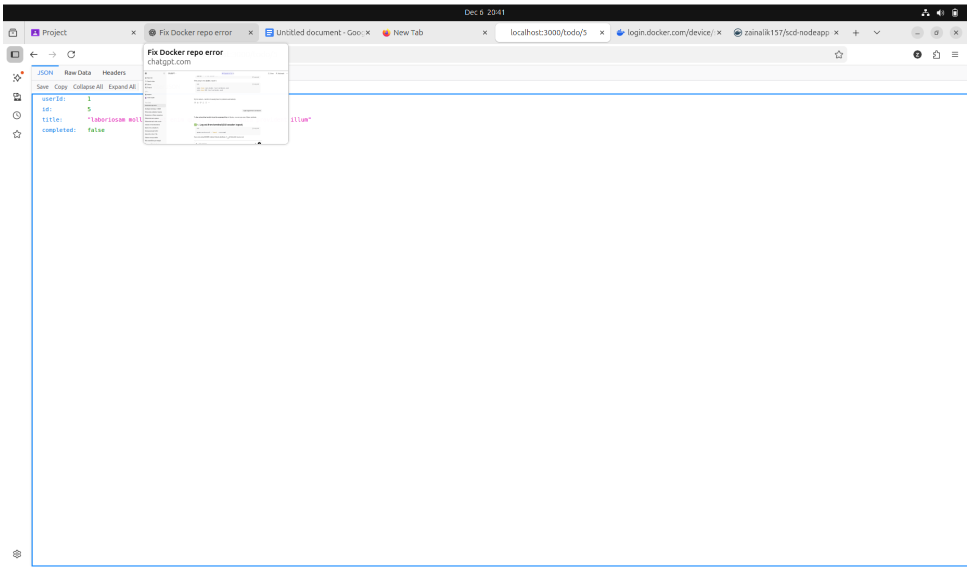
```
userId:      1
id:          1
title:       "delectus aut autem"
completed:   false
```

Figure 15: Final Testing - Part 2

2.11 Summary - Part 2

Docker solves the environment inconsistency problem by:

1. Packaging the application with its required Node.js version (18)
2. Isolating the application from the host system
3. Ensuring consistent behavior across development and production
4. Not affecting other applications on the server that require Node.js 16



```
userId:      1
id:          5
title:       "laboriosam moll                              illum"
completed:   false
```

Figure 16: Final Testing - Part 3

Task	Status
Identified correct Node.js version (18)	✓
Created Dockerfile	✓
Built Docker image locally	✓
Tested container locally	✓
Published to Docker Hub	✓
Deployed on server	✓
Tested backend service	✓

Table 3: Part 2 Summary