

PERSONAL ENGINEERING CONCEPT

Manufacturing Quality & Traceability Demo

Barcode Duplicate Detection - Concept Demo



QUALITY
ASSURANCE



TRACEABILITY



DUPLICATE
DETECTION



DATA DRIVEN
DECISIONS



Python / Streamlit Application



BUILT-IN QUALITY
BUILT-IN TRUST



END-TO-END
TRACEABILITY



AUTOMATED
VERIFICATION

Personal engineering concept created for educational and demonstration purposes.

DUPLICATE DETECTION DASHBOARD

SCAN RESULT



UNIQUE

No Duplicates Found

TRACEABILITY



SCAN



VALIDATE



RECORD



VERIFY

SCAN HISTORY (LAST 5)

● P7A1B2C3D4	12:34:56 PM	UNIQUE
● A1B2C3D4E5	12:33:41 PM	UNIQUE
● P7A1B2C3D4	12:31:22 PM	DUPLICATE
● B2C3D4E5F6	12:30:10 PM	UNIQUE
● C3D4E5F6G7	12:29:02 PM	UNIQUE

LAST SCAN

P7A1B2C3D4

12:34:56 PM



Barcode Duplicate Detection - Concept Demo

Manufacturing barcode verification and duplicate-detection workflow.

Scan Barcode

Station

Oil Sump Line - Final Verification

Operator / Technician

Sam Khalaf

Barcode Scanner Input

DEMO-OS-2026-000004

Check Barcode

PASS - New Barcode Accepted

Barcode: DEMO-OS-2026-000004

Scan Time: 2026-06-19 05:16:10

Demo Controls

For a real plant system, this would connect to the barcode scanner, PLC, vision station, or MES database. This beta version uses a local SQLite database.

Clear Demo Data

PASS Scenario — New Barcode Accepted

Scan History

	id	barcode	scan_time	station	operator	status
0	7	DEMO-OS-2026-000004	2026-06-19 05:16:10	Oil Sump Line - Final Verification	Sam Khalaf	PASS
1	6	DEMO-OS-2026-000003	2026-06-19 05:10:04	Oil Sump Line - Final Verification	Demo Operator	DUPLICATE
2	5	DEMO-OS-2026-000003	2026-06-19 05:09:59	Oil Sump Line - Final Verification	Demo Operator	PASS
3	4	DEMO-OS-2026-000001	2026-06-19 04:59:58	Oil Sump Line - Final Verification	Demo Operator	DUPLICATE
4	3	CM-OS-2026-000001	2026-06-19 04:59:51	Oil Sump Line - Final Verification	Demo Operator	DUPLICATE

Barcode Duplicate Detection - Concept Demo

Manufacturing barcode verification and duplicate-detection workflow.

Demo concept for oil sump line barcode verification after GM barcode etching.

Scan Barcode

Station

Oil Sump Line - Final Verification



Operator / Technician

Sam Khalaf

Barcode Scanner Input

DEMO-OS-2026-000004

Check Barcode

DUPLICATE BARCODE DETECTED

Barcode: DEMO-OS-2026-000004

Current Scan Time: 2026-06-19 05:18:20

First Seen Time: 2026-06-19 05:16:10

First Station: Oil Sump Line - Final Verification

First Operator: Sam Khalaf

Demo Controls

For a real plant system, this would connect to the barcode scanner, PLC, vision station, or MES database. This beta version uses a local SQLite database.

Clear Demo Data

FAIL Scenario — Duplicate Barcode Detected

Scan History

	id	barcode	scan_time	station	operator	status
0	8	DEMO-OS-2026-000004	2026-06-19 05:18:20	Oil Sump Line - Final Verification	Sam Khalaf	DUPLICATE
1	7	DEMO-OS-2026-000004	2026-06-19 05:16:10	Oil Sump Line - Final Verification	Sam Khalaf	PASS
2	6	DEMO-OS-2026-000003	2026-06-19 05:10:04	Oil Sump Line - Final Verification	Demo Operator	DUPLICATE
3	5	DEMO-OS-2026-000003	2026-06-19 05:09:59	Oil Sump Line - Final Verification	Demo Operator	PASS
4	4	DEMO-OS-2026-000001	2026-06-19 04:59:58	Oil Sump Line - Final Verification	Demo Operator	DUPLICATE
5	3	DEMO-OS-2026-000001	2026-06-19 04:59:51	Oil Sump Line - Final Verification	Demo Operator	DUPLICATE
6	2	DEMO-OS-2026-000002	2026-06-19 04:59:38	Oil Sump Line - Final Verification	Demo Operator	PASS
7	1	DEMO-OS-2026-000001	2026-06-19 04:59:23	Oil Sump Line - Final Verification	Demo Operator	PASS

Total Scans

8

Passed

4

Duplicates

4

Built with Python, Streamlit, SQLite, and Pandas
Stores scan records locally and checks duplicate barcode entries

Setup a virtual environment

The screenshot displays the Visual Studio Code (VS Code) interface with a project named `barcode_demo`. The Explorer sidebar on the left shows the project structure, including `app.py`, `barcode_demo.db`, and a `.venv` directory. The main editor window shows the `app.py` file, which is a Python script for a Streamlit application. The script imports `streamlit`, `sqlite3`, and `pandas`, and sets up a database connection. It includes several comments describing the application's purpose: "Manufacturing Quality - Concept Demo", "Barcode Duplicate Detection - Concept Demo", and "Python / Streamlit Application". The script also includes a date created comment and a note about the concept demo using manual barcode entry. The bottom of the screen shows the Terminal panel with the command `./venv/bin/python -m pip install streamlit pandas` and the output of the command, which includes a warning about the `'use_container_width'` attribute.

```
1 import streamlit as st
2 import sqlite3
3 import pandas as pd
4 from datetime import datetime
5
6 DB_NAME = "barcode_demo.db"
7
8 # Manufacturing Quality - Concept Demo
9 # Barcode Duplicate Detection - Concept Demo
10 # Python / Streamlit Application
11 #
12 # Date Created: 06/18/2026
13 #
14 # This concept demo uses manual barcode entry to simulate the scanning process.
15 # The purpose is to test and demonstrate duplicate barcode detection logic
16 # without requiring live hardware integration.
17 #
18 # In a production implementation, the system could be connected directly to
19 # the barcode scanner's API, keyboard-wedge input, PLC signal, MES database,
20 # or vision station output to automatically capture sample barcodes
21 # in real time.
22 #
23 # Potential future integrations:
```

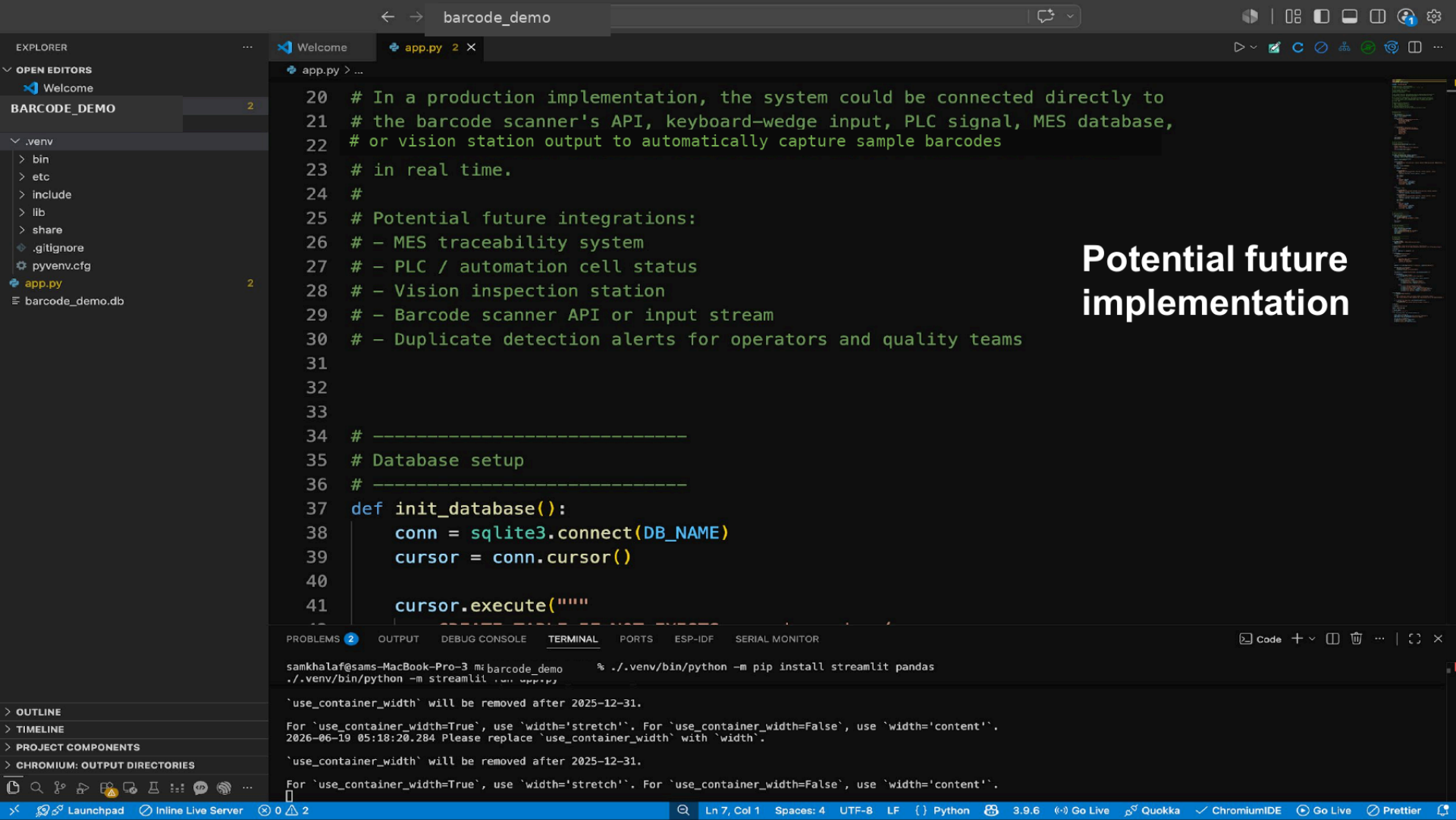
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS ESP-IDF SERIAL MONITOR

```
samkhalaf@sams-MacBook-Pro-3 m:barcode_demo % ./venv/bin/python -m pip install streamlit pandas
./venv/bin/python -m streamlit run app.py

'use_container_width' will be removed after 2025-12-31.
For 'use_container_width=True', use 'width='stretch''. For 'use_container_width=False', use 'width='content''.
2026-06-19 05:35:52.512 Please replace 'use_container_width' with 'width'.
'use_container_width' will be removed after 2025-12-31.
For 'use_container_width=True', use 'width='stretch''. For 'use_container_width=False', use 'width='content'.'.
[]
```

Launchpad Inline Live Server 2

Ln 13, Col 2 Spaces: 4 UTF-8 LF Python 3.9.6 Go Live Quokka ChromiumIDE Go Live Prettier



Potential future
implementation

```
20 # In a production implementation, the system could be connected directly to
21 # the barcode scanner's API, keyboard-wedge input, PLC signal, MES database,
22 # or vision station output to automatically capture sample barcodes
23 # in real time.
24 #
25 # Potential future integrations:
26 # - MES traceability system
27 # - PLC / automation cell status
28 # - Vision inspection station
29 # - Barcode scanner API or input stream
30 # - Duplicate detection alerts for operators and quality teams
31
32
33
34 # -----
35 # Database setup
36 # -----
37 def init_database():
38     conn = sqlite3.connect(DB_NAME)
39     cursor = conn.cursor()
40
41     cursor.execute("""
```

PROBLEMS 2 OUTPUT DEBUG CONSOLE TERMINAL PORTS ESP-IDF SERIAL MONITOR

```
samkhalaf@sams-MacBook-Pro-3 m1:barcode_demo % ./venv/bin/python -m pip install streamlit pandas
./venv/bin/python -m streamlit run app.py

`use_container_width` will be removed after 2025-12-31.
For `use_container_width=True`, use `width='stretch'`. For `use_container_width=False`, use `width='content'`.
2026-06-19 05:18:20.284 Please replace `use_container_width` with `width`.
`use_container_width` will be removed after 2025-12-31.
For `use_container_width=True`, use `width='stretch'`. For `use_container_width=False`, use `width='content'`.
0
```

Printable PDF Report & Audit Log

Exportable quality record for barcode verification, duplicate detection, and production traceability.

6/19/26, 5:35 AM

Barcode Duplicate Check

Barcode Duplicate Detection - Concept Demo
Manufacturing barcode verification demonstration.

Scan Barcode

Station

Oil Sump Line - Final Verification

Operator / Technician

Sam Khalaf

Barcode Scanner Input

DEMO-05-2026-000009

Check Barcode

PASS - New Barcode Accepted

DEMO-05-2026-000009

Barcode

DEMO-05-2026-000009

Scan Time: 2026-06-19 05:35:52

Demo Controls

For a real plant system, this would connect to the barcode scanner, PLC, vision station, or MES database. This beta version uses a local SQLite database.

Clear Demo Data

Scan History

id	barcode	scan_time	station
0	DEMO-05-2026-000009	2026-06-19 05:35:52	Oil Sump Line - Final Verification
1	DEMO-05-2026-000004	2026-06-19 05:18:20	Oil Sump Line - Final Verification
2	DEMO-05-2026-000004	2026-06-19 05:16:10	Oil Sump Line - Final Verification
3	DEMO-05-2026-000003	2026-06-19 05:10:04	Oil Sump Line - Final Verification
4	DEMO-05-2026-000003	2026-06-19 05:09:59	Oil Sump Line - Final Verification
5	DEMO-05-2026-000001	2026-06-19 04:59:58	Oil Sump Line - Final Verification
6	DEMO-05-2026-000001	2026-06-19 04:59:51	Oil Sump Line - Final Verification
7	DEMO-05-2026-000002	2026-06-19 04:59:38	Oil Sump Line - Final Verification
8	DEMO-05-2026-000001	2026-06-19 04:59:23	Oil Sump Line - Final Verification

Total Scans

9

Passed

5

Duplicates

4



Printable PDF output

One-click export of the complete report for sharing and record keeping.



Operator, station, and timestamp traceability

Full context of who, where, and when each scan occurred.



Pass / duplicate verification history

Clear visibility into results with complete scan history and status.



Audit-ready quality record

Structured, immutable log for compliance and quality audits.



Supports quality review, shift handoff, and traceability documentation.

