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OVERVIEW:

This project provides a versatile, cross-platform, dual-interface inventory management system tailored for the Linac Coherent Light Source (LCLS) at SLAC National Accelerator Laboratory. It offers both a user-friendly desktop Graphical User Interface (GUI) and a powerful command-line interface (CLI). Both interfaces can be used for managing tools, parts, and consumables. Data is stored in a hybrid backend system that uses a MySQL database for both reliable and local data persistence, and Google Sheets for cloud-based collaboration.

PROBLEM:

The existing inventory system at SLAC-LCLS relied solely on a large, complex Google Sheet that was difficult to navigate and edit. Technicians and engineers frequently took parts without documenting their actions, leading to inaccurate stock counts and disorganized tracking.

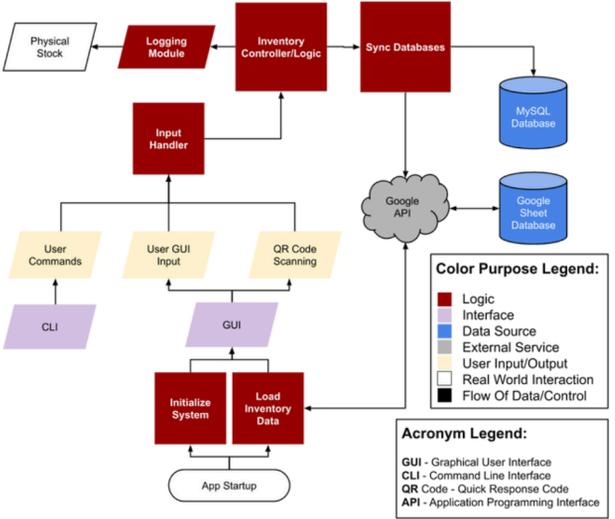
FEATURES:

This system was designed to streamline inventory management with reliability, usability, convenience, and scalability in mind.

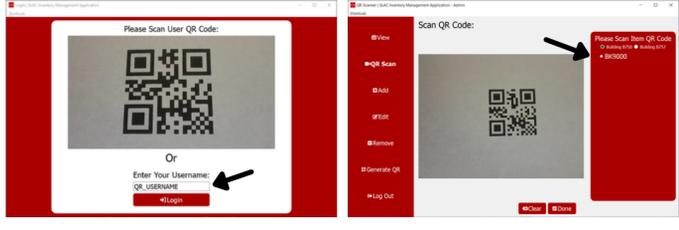
Key features of the application include:

- Dual Interface
- Inventory Table View
- Restock Status Flags
- QR Code Scanning & Generation
- Manual Or Automatic Entry & Edits
- Data Export & File Generation
- Redundant Data Storage
- Live Inventory Tracking
- Smart Restock Alerts
- Automated Logging
- Asynchronous Programming

DIAGRAM:

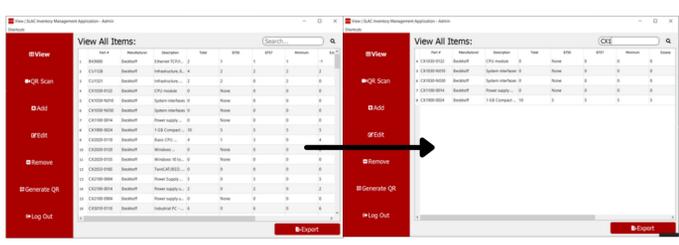


GUI:



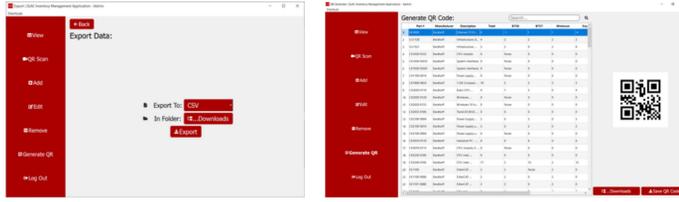
Login and item scanning with QR codes

The GUI offers a fully interactive interface built for inventory management, QR code scanning, and data generation. Users can only access the QR scanning features through the GUI – enabling live scanning for users or parts.

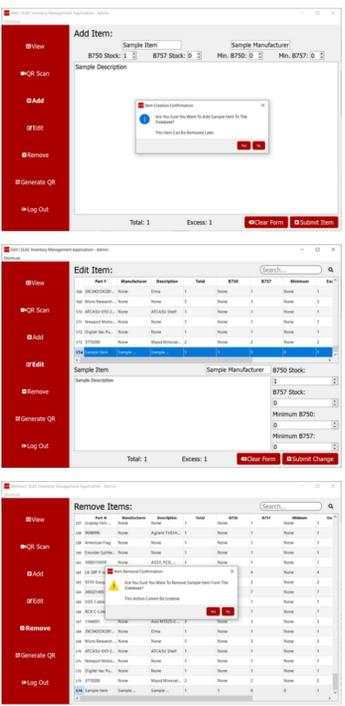


Item viewing and searching with table view.

With visual feedback and immediate item lookup, the GUI is ideal when for visual control, real-time feedback, and a modern, polished look without typing commands.



Download data with the Export or QR Generate pages



Item interaction with the Add, Edit, and Remove pages

CLI:

The CLI provides quick access to powerful backend tasks without launching the GUI. This feature runs entirely in command line, meaning you can automate regular tasks, integrate into pipelines, or simply run operations faster and more efficiently than using the GUI.

```

python -m stock_manager --help
usage: main.py [-h] [-v] [-q] [-s] [-l] [-i] [-r] [-b] [-w] [-e] [-c] [-d] [-f] [-g] [-m] [-n] [-o] [-p] [-r] [-s] [-t] [-u] [-v] [-w] [-x] [-y] [-z] [-aa] [-ab] [-ac] [-ad] [-ae] [-af] [-ag] [-ah] [-ai] [-aj] [-ak] [-al] [-am] [-an] [-ao] [-ap] [-aq] [-ar] [-as] [-at] [-au] [-av] [-aw] [-ax] [-ay] [-az] [-ba] [-bb] [-bc] [-bd] [-be] [-bf] [-bg] [-bh] [-bi] [-bj] [-bk] [-bl] [-bm] [-bn] [-bo] [-bp] [-bq] [-br] [-bs] [-bt] [-bu] [-bv] [-bw] [-bx] [-by] [-bz] [-ca] [-cb] [-cc] [-cd] [-ce] [-cf] [-cg] [-ch] [-ci] [-cj] [-ck] [-cl] [-cm] [-cn] [-co] [-cp] [-cq] [-cr] [-cs] [-ct] [-cu] [-cv] [-cw] [-cx] [-cy] [-cz] [-da] [-db] [-dc] [-dd] [-de] [-df] [-dg] [-dh] [-di] [-dj] [-dk] [-dl] [-dm] [-dn] [-do] [-dp] [-dq] [-dr] [-ds] [-dt] [-du] [-dv] [-dw] [-dx] [-dy] [-dz] [-ea] [-eb] [-ec] [-ed] [-ee] [-ef] [-eg] [-eh] [-ei] [-ej] [-ek] [-el] [-em] [-en] [-eo] [-ep] [-eq] [-er] [-es] [-et] [-eu] [-ev] [-ew] [-ex] [-ey] [-ez] [-fa] [-fb] [-fc] [-fd] [-fe] [-ff] [-fg] [-fh] [-fi] [-fj] [-fk] [-fl] [-fm] [-fn] [-fo] [-fp] [-fq] [-fr] [-fs] [-ft] [-fu] [-fv] [-fw] [-fx] [-fy] [-fz] [-ga] [-gb] [-gc] [-gd] [-ge] [-gf] [-gg] [-gh] [-gi] [-gj] [-gk] [-gl] [-gm] [-gn] [-go] [-gp] [-gq] [-gr] [-gs] [-gt] [-gu] [-gv] [-gw] [-gx] [-gy] [-gz] [-ha] [-hb] [-hc] [-hd] [-he] [-hf] [-hg] [-hh] [-hi] [-hj] [-hk] [-hl] [-hm] [-hn] [-ho] [-hp] [-hq] [-hr] [-hs] [-ht] [-hu] [-hv] [-hw] [-hx] [-hy] [-hz] [-ia] [-ib] [-ic] [-id] [-ie] [-if] [-ig] [-ih] [-ii] [-ij] [-ik] [-il] [-im] [-in] [-io] [-ip] [-iq] [-ir] [-is] [-it] [-iu] [-iv] [-iw] [-ix] [-iy] [-iz] [-ja] [-jb] [-jc] [-jd] [-je] [-jf] [-jg] [-jh] [-ji] [-jj] [-jk] [-jl] [-jm] [-jn] [-jo] [-jp] [-jq] [-jr] [-js] [-jt] [-ju] [-jv] [-jw] [-jx] [-jy] [-jz] [-ka] [-kb] [-kc] [-kd] [-ke] [-kf] [-kg] [-kh] [-ki] [-kj] [-kl] [-km] [-kn] [-ko] [-kp] [-kq] [-kr] [-ks] [-kt] [-ku] [-kv] [-kw] [-kx] [-ky] [-kz] [-la] [-lb] [-lc] [-ld] [-le] [-lf] [-lg] [-lh] [-li] [-lj] [-lk] [-ll] [-lm] [-ln] [-lo] [-lp] [-lq] [-lr] [-ls] [-lt] [-lu] [-lv] [-lw] [-lx] [-ly] [-lz] [-ma] [-mb] [-mc] [-md] [-me] [-mf] [-mg] [-mh] [-mi] [-mj] [-mk] [-ml] [-mm] [-mn] [-mo] [-mp] [-mq] [-mr] [-ms] [-mt] [-mu] [-mv] [-mw] [-mx] [-my] [-mz] [-na] [-nb] [-nc] [-nd] [-ne] [-nf] [-ng] [-nh] [-ni] [-nj] [-nk] [-nl] [-nm] [-nn] [-no] [-np] [-nq] [-nr] [-ns] [-nt] [-nu] [-nv] [-nw] [-nx] [-ny] [-nz] [-oa] [-ob] [-oc] [-od] [-oe] [-of] [-og] [-oh] [-oi] [-oj] [-ok] [-ol] [-om] [-on] [-oo] [-op] [-oq] [-or] [-os] [-ot] [-ou] [-ov] [-ow] [-ox] [-oy] [-oz] [-pa] [-pb] [-pc] [-pd] [-pe] [-pf] [-pg] [-ph] [-pi] [-pj] [-pk] [-pl] [-pm] [-pn] [-po] [-pp] [-pq] [-pr] [-ps] [-pt] [-pu] [-pv] [-pw] [-px] [-py] [-pz] [-qa] [-qb] [-qc] [-qd] [-qe] [-qf] [-qg] [-qh] [-qi] [-qj] [-qk] [-ql] [-qm] [-qn] [-qo] [-qp] [-qq] [-qr] [-qs] [-qt] [-qu] [-qv] [-qw] [-qx] [-qy] [-qz] [-ra] [-rb] [-rc] [-rd] [-re] [-rf] [-rg] [-rh] [-ri] [-rj] [-rk] [-rl] [-rm] [-rn] [-ro] [-rp] [-rq] [-rr] [-rs] [-rt] [-ru] [-rv] [-rw] [-rx] [-ry] [-rz] [-sa] [-sb] [-sc] [-sd] [-se] [-sf] [-sg] [-sh] [-si] [-sj] [-sk] [-sl] [-sm] [-sn] [-so] [-sp] [-sq] [-sr] [-ss] [-st] [-su] [-sv] [-sw] [-sx] [-sy] [-sz] [-ta] [-tb] [-tc] [-td] [-te] [-tf] [-tg] [-th] [-ti] [-tj] [-tk] [-tl] [-tm] [-tn] [-to] [-tp] [-tq] [-tr] [-ts] [-tt] [-tu] [-tv] [-tw] [-tx] [-ty] [-tz] [-ua] [-ub] [-uc] [-ud] [-ue] [-uf] [-ug] [-uh] [-ui] [-uj] [-uk] [-ul] [-um] [-un] [-uo] [-up] [-uq] [-ur] [-us] [-ut] [-uu] [-uv] [-uw] [-ux] [-uy] [-uz] [-va] [-vb] [-vc] [-vd] [-ve] [-vf] [-vg] [-vh] [-vi] [-vj] [-vk] [-vl] [-vm] [-vn] [-vo] [-vp] [-vq] [-vr] [-vs] [-vt] [-vu] [-vv] [-vw] [-vx] [-vy] [-vz] [-wa] [-wb] [-wc] [-wd] [-we] [-wf] [-wg] [-wh] [-wi] [-wj] [-wk] [-wl] [-wm] [-wn] [-wo] [-wp] [-wq] [-wr] [-ws] [-wt] [-wu] [-wv] [-ww] [-wx] [-wy] [-wz] [-xa] [-xb] [-xc] [-xd] [-xe] [-xf] [-xg] [-xh] [-xi] [-xj] [-xk] [-xl] [-xm] [-xn] [-xo] [-xp] [-xq] [-xr] [-xs] [-xt] [-xu] [-xv] [-xw] [-xx] [-xy] [-xz] [-ya] [-yb] [-yc] [-yd] [-ye] [-yf] [-yg] [-yh] [-yi] [-yj] [-yk] [-yl] [-ym] [-yn] [-yo] [-yp] [-yq] [-yr] [-ys] [-yt] [-yu] [-yv] [-yw] [-yx] [-yy] [-yz] [-za] [-zb] [-zc] [-zd] [-ze] [-zf] [-zg] [-zh] [-zi] [-zj] [-zk] [-zl] [-zm] [-zn] [-zo] [-zp] [-zq] [-zr] [-zs] [-zt] [-zu] [-zv] [-zw] [-zx] [-zy] [-zz]
    
```

All commands can be listed using --help.

```

python -m stock_manager --add-item "Sample Item" "No Manufacturer" "Sample Description" 0 0 0 0 0 "Out of Stock"
[+] Adding "Sample Item" to Databases...
[+] Successfully Added "Sample Item" to Items Databases

python -m stock_manager --search-items "Sample Item"
[+] Searching For Items With "Sample Item"...

[+] Stock Items Report
-----
# | Name | Manufacturer | Total | B750 Stock | B757 Stock | B750 Min | B757 Min | Excess | Status | Description |
-----
174 | Sample Item | No Manufacturer | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Out of Stock | Sample Description |
-----
[+] Total Items: 1 | Out of Stock: 1 | Low Stock: 0 | In Stock: 0 | Other: 0

python -m stock_manager --remove-item "Sample Item"
[+] Removing "Sample Item" from Databases...
[+] Successfully Removed Sample Item From Databases

python -m stock_manager --search-items "Sample Item"
[+] Searching For Items With "Sample Item"...

[+] Stock Items Report
-----
# | Name | Manufacturer | Total | B750 Stock | B757 Stock | B750 Min | B757 Min | Excess | Status | Description |
-----
-----
[+] Total Items: 0 | Out of Stock: 0 | Low Stock: 0 | In Stock: 0 | Other: 0
    
```

Example usage of adding, searching, and deleting items from the CLI.

```

> python -m stock_manager --export ./exports csv
[+] Exporting Data As .csv File...
[*] Successfully Exported Data To csv File

> python -m stock_manager -qr ./exports "Sample Item"
[+] Exporting Sample Item QR Code As .PNG...
[*] Successfully Exported Sample Item QR Code
    
```

Example usage of downloading all item data and QR codes from the CLI

Most features available in the GUI can also be performed through the CLI, making it a versatile tool for advanced users. The primary exception is camera-based actions like QR scanning, which require a graphical interface. For users comfortable with terminal workflows, the CLI offers full control and flexibility without sacrificing functionality.

IMPACT:

This project allows inventory managers at SLAC-LCLS to efficiently track and manage stock with greater accuracy and ease. By streamlining the checkout and return process through intuitive interfaces and QR code scanning, it reduces errors and data gaps common with manual spreadsheet entry. Managers gain real-time visibility into inventory levels, improving restocking decisions and minimizing downtime caused by missing or untracked parts. The system's robust logging and dual database support reliability, ultimately increasing operational efficiency and confidence in stock data. Additionally, key features like restock notifications and real-time restock status help make timely decisions, minimizing downtime—boosting confidence and operational efficiency across teams.

ACKNOWLEDGEMENTS:

I'd like to thank my mentor, Tyler Johnson, and all my coworkers at LCLS Controls for their generous support, patience and technical guidance. Their feedback and insight helped shape every part of this system. The experience I gained from working with them has been invaluable; the industry standard coding practices, problem-solving approaches, and overall professionalism they shared with me will stay with me and shape my development as a programmer for years to come.

GITHUB REPOSITORY:

<https://github.com/pcdshub/stock-management.git>

