■ Complete Fix for Black Login Screen

Problem: Display shows black login screen instead of moOde web UI

■ Root Cause

The X server is not running. Without X server, Chromium cannot display windows.

■ Solution Steps (Run on Pi)

Step 1: Kill Everything

```
# Kill all display-related processes
sudo pkill -9 chromium
sudo pkill -9 Xorg
sudo pkill -9 lightdm
sudo pkill -9 gdm
```

Step 2: Start X Server

```
# Start graphical target (includes X server)
sudo systemctl start graphical.target

# Wait a few seconds
sleep 5

# Verify X server is running
ps aux | grep Xorg | grep -v grep
```

Step 3: Restart Display Service

```
# Restart localdisplay service
sudo systemctl restart localdisplay.service

# Wait for it to start
sleep 5

# Check status
systemctl status localdisplay.service
```

Step 4: Verify Everything

```
# Check X server
ps aux | grep Xorg | grep -v grep
# Should show Xorg process

# Check Chromium
pgrep -f chromium
# Should show PID

# Check web server
curl http://localhost/
# Should return HTML

# Check display
DISPLAY=:0 xwininfo -root -tree | grep chromium
# Should show Chromium window
```

■ Alternative: Manual X Server Start

If `graphical.target` doesn't work:

```
# Start X server manually (as root)
sudo startx &

# Wait for X to start
sleep 5

# Start Chromium
DISPLAY=:0 /usr/local/bin/start-chromium-clean.sh
```

■ Alternative: Fix via SD Card (Mac)

If SSH is not accessible:

1. **Insert SD card into Mac**
2. **Mount SD card** (should appear as `bootfs` and `rootfs`)
3. **Check X server configuration:**
   ```
   # Check if X server service exists
   ls /Volumes/rootfs/lib/systemd/system/x*.service

   # Check localdisplay.service
   cat /Volumes/rootfs/lib/systemd/system/localdisplay.service
   ```

4. **Enable graphical target:**
   ```
   # Enable graphical target
   sudo ln -sf /lib/systemd/system/graphical.target \
     /Volumes/rootfs/etc/systemd/system/default.target
   ```

5. **Eject and boot Pi**

■ Verification Checklist

After applying fixes:

- [ ] X server is running (`ps aux | grep Xorg`)
- [ ] Chromium is running (`pgrep -f chromium`)
- [ ] Web server is accessible (`curl http://localhost/`)
- [ ] Chromium window is visible (`DISPLAY=:0 xwininfo -root -tree | grep chromium`)
- [ ] Display shows moOde web UI (not black screen)

■■ Common Issues

Issue: X Server Won't Start

Symptoms:
- `ps aux | grep Xorg` shows nothing
- `DISPLAY=:0 xdpyinfo` fails

Solutions:
1. Check X server logs: `tail -50 /var/log/Xorg.0.log`
2. Check for hardware issues: `dmesg | grep -i display`
3. Try manual start: `sudo startx &`
4. Check display configuration: `/boot/firmware/config.txt`

Issue: Chromium Runs But No Window

Symptoms:
• `pgrep -f chromium` shows PID
• `DISPLAY=:0 xwininfo -root -tree` shows no Chromium

Solutions:
1. Kill and restart Chromium: `pkill -9 chromium && DISPLAY=:0
/usr/local/bin/start-chromium-clean.sh`
2. Check Chromium logs: `tail -50 /var/log/chromium-clean.log`
3. Verify X display: `DISPLAY=:0 xdpyinfo`

Issue: Display Still Black After All Fixes

Solutions:
1. Wait 20-30 seconds (Chromium may be loading)
2. Check if display hardware is working: `cat /sys/class/graphics/fb0/virtual_size`
3. Try rebooting: `sudo reboot`
4. Check display cables/connections

■ Quick Fix Script

Save this as `fix-display.sh` on Pi:

```bash
#!/bin/bash
echo "Fixing display..."

# Kill everything
sudo pkill -9 chromium Xorg lightdm gdm

# Start X server
sudo systemctl start graphical.target
sleep 5

# Restart display service
sudo systemctl restart localdisplay.service
sleep 5

# Check status
echo ""
echo "Status:"
echo "  X Server: $(ps aux | grep Xorg | grep -v grep >/dev/null && echo "■ Running" || echo "■ Not
echo "  Chromium: $(pgrep -f chromium >/dev/null && echo "■ Running" || echo "■ Not running")"
echo "  Web Server: $(curl -s http://localhost/ >/dev/null 2>&1 && echo "■ Accessible" || echo "■ No
```

Run: `sudo bash fix-display.sh`

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