Creating an Integrated Network of Computers and Displays to Increase Efficiency of Cleanroom Work

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Background

Due to cleanroom standards and restrictions, paper is not allowed in a cleanroom. This results in heavy reliance on computers and tablets to display information, such as drawings and assembly procedures, when doing work in a cleanroom. Technicians and engineers need constant access to documentation, live feeds, and equipment updates. However, having to change between several different devices to utilize these advantages is inconvenient and inefficient. As such, an integrated system that connects the devices to easily resume work from one device to another is greatly needed.
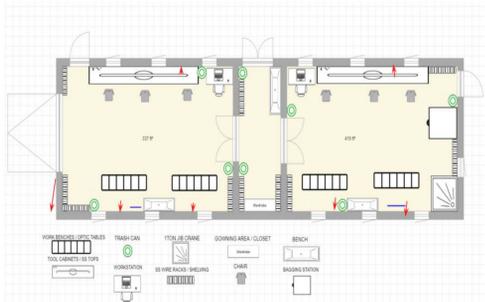
Layout

Fig 1: B750 Cleanroom Preliminary Floor Plan

- This layout was provided at the beginning of the project.

- The preliminary cleanroom layout includes two screens at a stationary workstation. Screens refers to one PC with two monitors (stationary).

- Input Devices: Stationary workstation screens share a single mouse and keyboard.

- Mobile screen has its own dedicated mouse and keyboard.

- After the research, a mobile screen and iPad/tablet are recommended to be added for increased efficiency.

- All screens connected by the GPU operate on Windows operating systems.

Fig 4: This setup features four screens, each displaying a key application for workflow efficiency: SharePoint for dashboard access, the CAD model for design reference, assembly travelers for step-by-step guidance, and Outlook for real-time communication. This layout allows engineers to seamlessly interact with all necessary tools at once, boosting productivity and reducing task-switching delays.

Research

- Conducted in-depth research into cleanroom workflows and digital integration

- Explored Ignition by Scada, MPX, OneDrive, and SharePoint as file-sharing and control tools

- Interviewed cleanroom workers about their user needs

- Evaluated hardware mounting solutions and cleanroom-safe devices

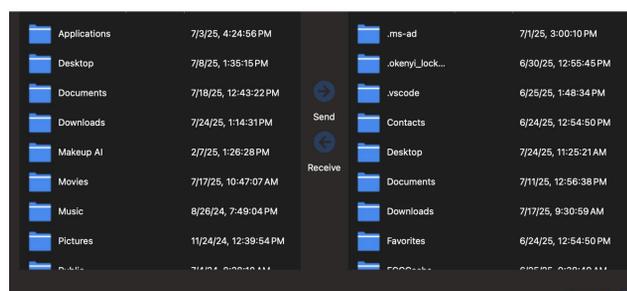- Researched and tested apps to connect iPads to wall screens via swipe/mirroring

Fig 2: VNC File Sharing Interface – MacBook to Multi-Screen Setup

Results

- Prototyped a working multi-display system using Virtual Network Computing (VNC) Viewer

- Enabled cleanroom technicians to swipe content from an iPad to large displays

- Achieved simultaneous viewing of CAD models and travelers, reducing task-switching delays

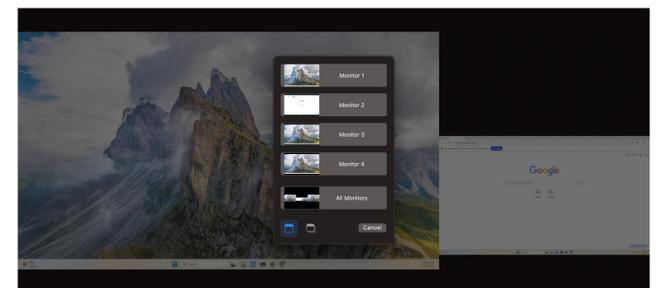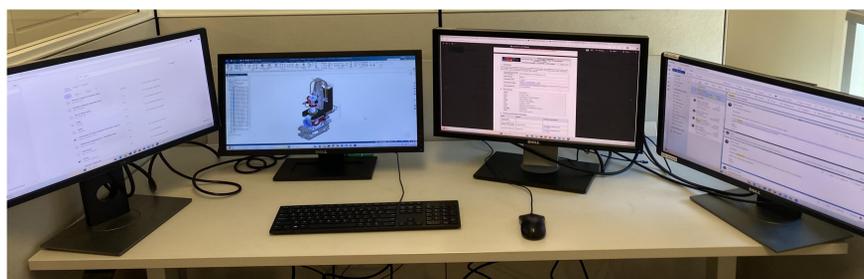- Improved workflow speed and clarity through digital integration

Fig 3: VNC Multi-Screen Overview with Switching Interface

System Overview

- Stationary workstation screens use multi-display graphics cards (GPU).

- Enables viewing of the CAD model on one screen and assembly travelers on another.

- Supports efficient multitasking.

- Mobile screen utilizes VNC Viewer

- Requires VNC Viewer software (server and viewer) to be installed on both devices.

iPad/ Tablet → GPU Network → VNC Viewer

Future Plans

- QR Code Access: Develop a scannable QR code that instantly opens the appropriate VNC Viewer connection on authorized devices for quicker access in the cleanroom.

- VNC Shortcut Integration: Create desktop or tablet shortcuts for each monitor to streamline connection setup and reduce friction during operation.

- Camera-Based Interaction: Explore integrating a camera system that detects engineer presence and motion, automatically switching or activating the relevant display screens to enhance user experience and efficiency.
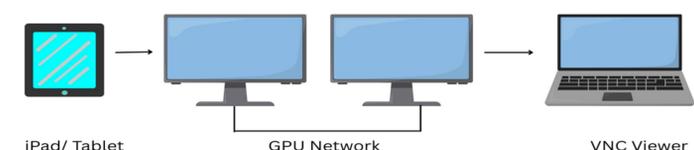
Summary

This project involved deep research into cross-platform integration, ergonomic display setups, and cleanroom-safe tech. The outcome was a flexible, scalable solution that enhanced clarity, access, and collaboration on the cleanroom floor.