

# **NASA Glenn PSL-3&4 Control System Upgrade**

**by**

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## **Summary:**

**An overview of the PSL-3&4 Jet Engine Test Facility control system; including its history, a description of the present effort to upgrade from Emerson Ovation v2.2 to V3.3.1, and future upgrade plans.**



# NASA Glenn PSL-3&4 Control System Upgrade

Paul J Lizanich



## Background

Facility originally constructed with panels containing pushbuttons, switches, loaders, and controllers.



## Background - WDPF

In 1990 a WDPF (Westinghouse Distributed Process Family) control system was installed in PSL.



## Background - WDPF

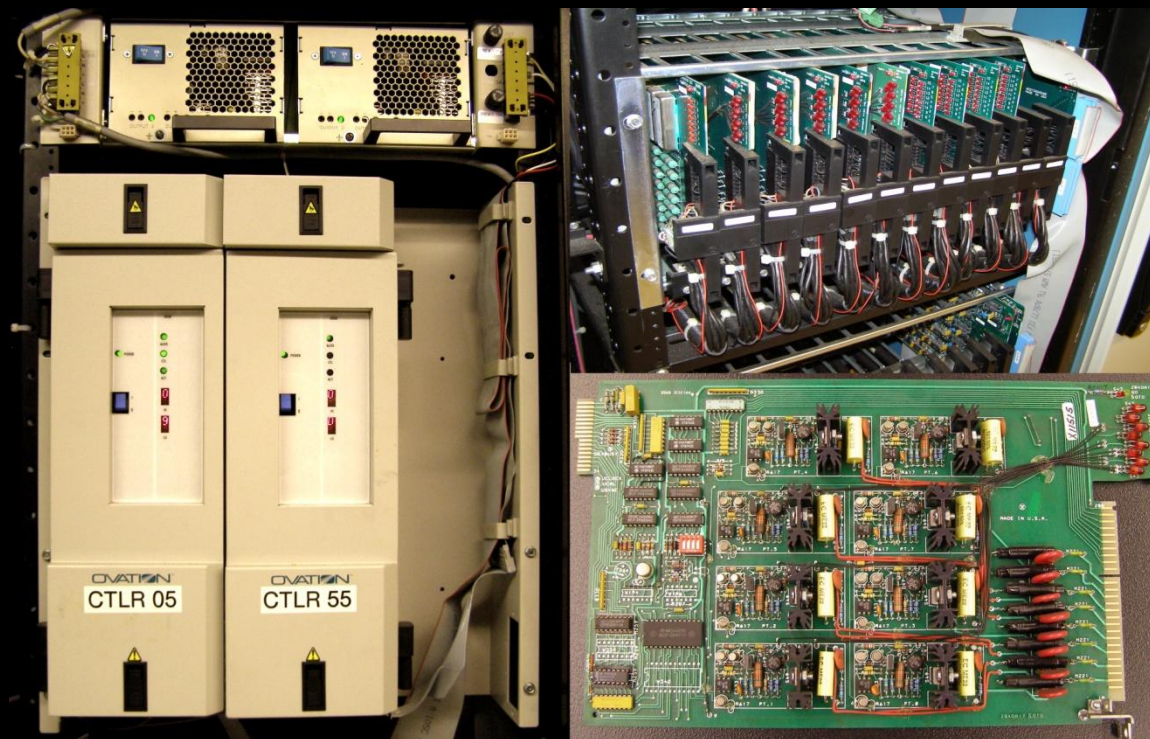
Similar systems were also installed in the IRT, 8x6, 9x15, and 10x10 wind tunnels.



## Background - WDPF

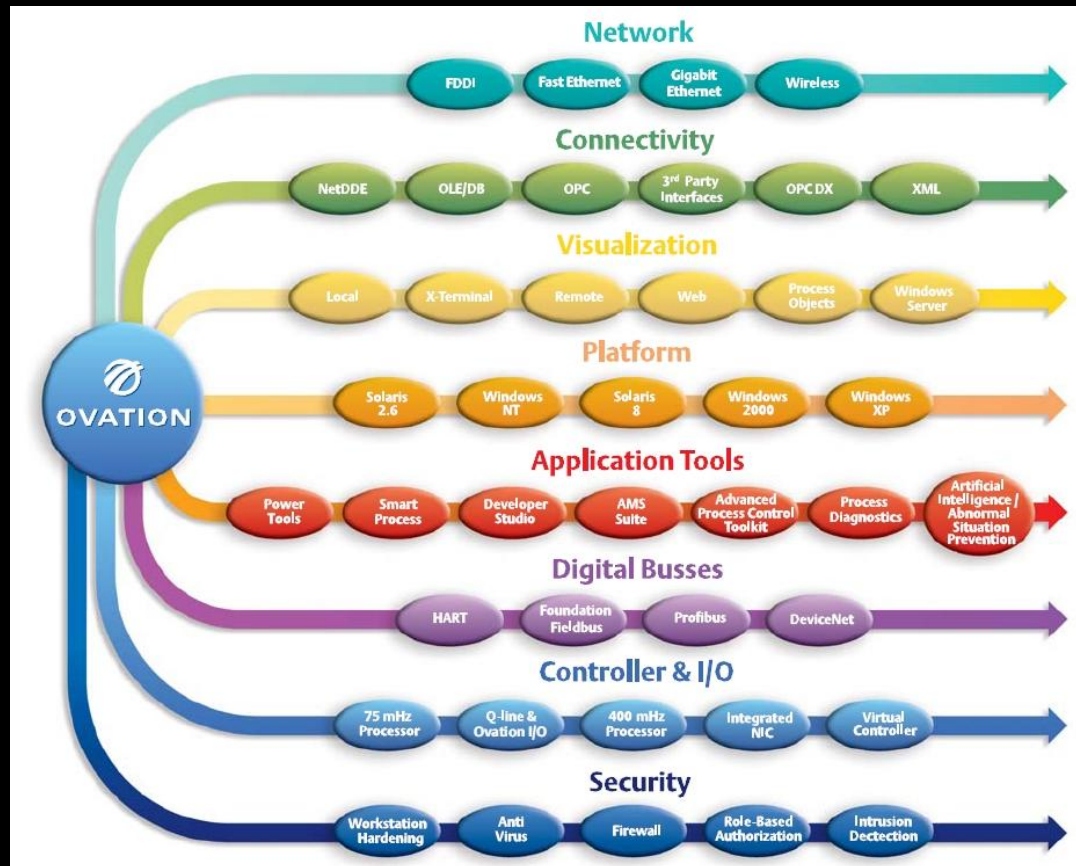
The WDPF systems included state-of-the-art 8 color graphics on WEStation operator consoles with bulky CRT monitors and chiclet keyboards.





## Background - WDPF

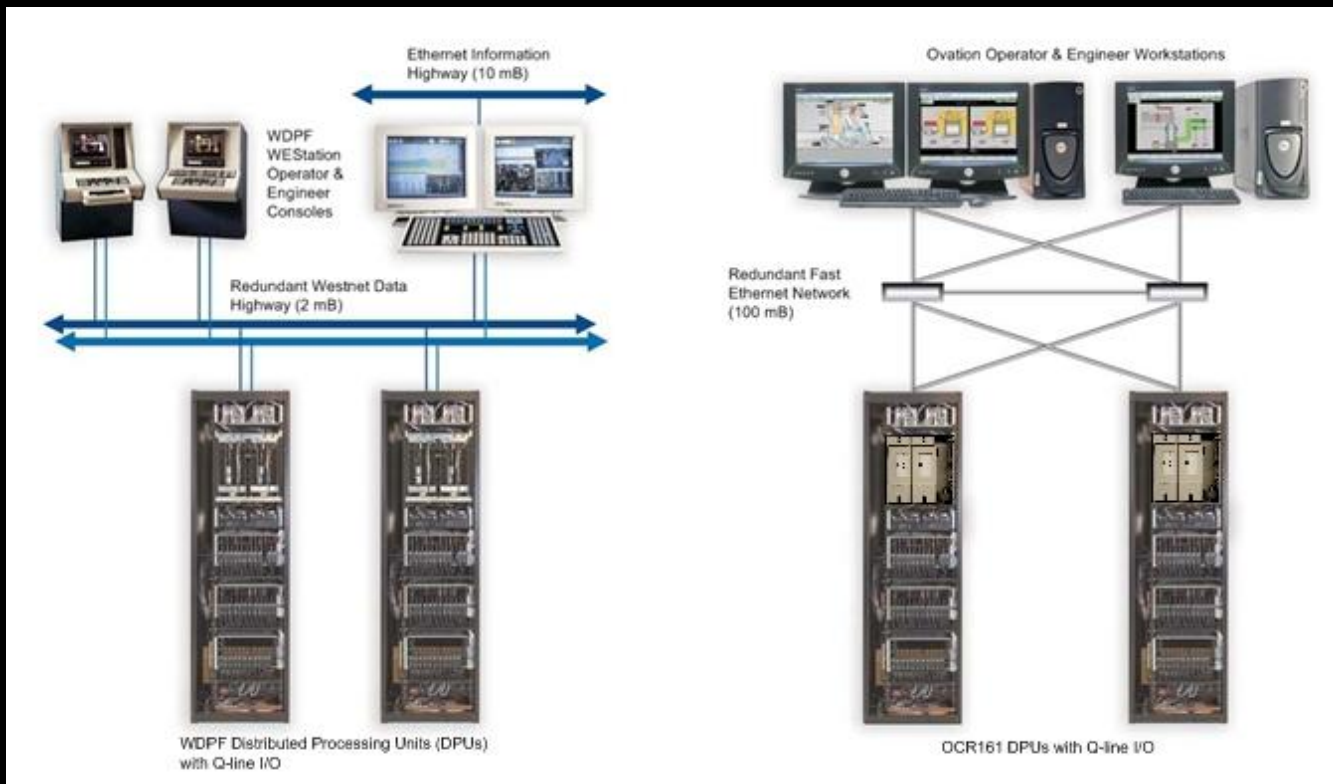
The WDPF system contained OCR-161 controllers and large Q-line I/O cards.



## Ovation Evolution

Ovation supports a wide variety of industry standard platforms, operating system, and network architectures; permitting incremental or discrete evolutions of each system as needed.





## Background – Ovation v2.2

In the early 2000s, WDPF evolved into the Ovation product line. NASA Glenn migrated from WDPF to Ovation v2.2 starting in 2002.



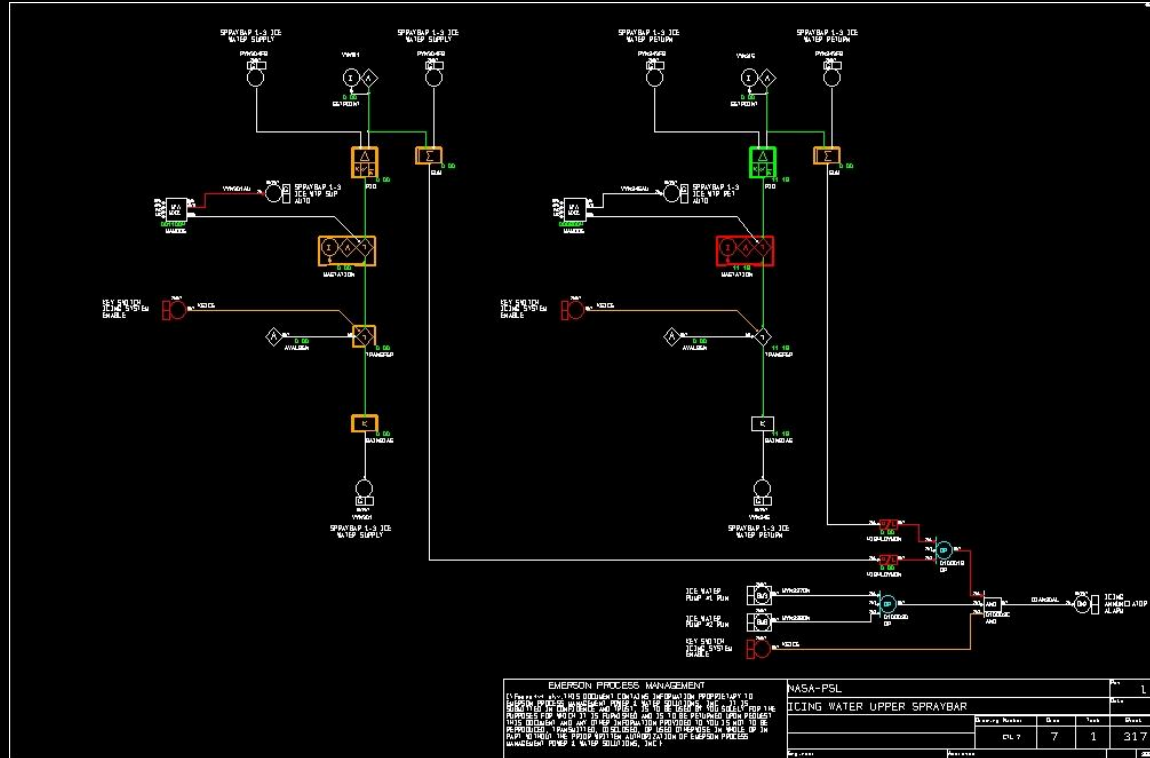
# Current Ovation Configuration

- NASA Glenn's major aeronautical facilities today:
  - Ovation v2.2
  - OCR-161 processors
  - AutoCAD control sheets
  - Win2k engineering and operator PCs
  - Windows NT servers
  - Historian
- The goal is to modernize the facilities around testing and budgetary constraints.



## Ovation Improvements since v2.2

Ovation v3.0 and above recommends upgrade to OCR400 processor. Ovation v3.0 enables Q-line to Ovation I/O migration.



## Ovation Improvements since v2.2

Ovation 3.1 and above requires migration from AutoCAD control sheet drawings to Emerson's eCAD drawings



## Other Ovation Improvements Since v2.2

- HART (Highway Addressable Remote Transducer) protocol devices require Ovation 2.3 and above
- Ovation 3.3.1 runs on Win 7 or XP operator stations, and Windows Server 2008 or 2003 server class machines





# Ovation Upgrade

- Emerson has a process called Evergreen for the migration of older WDPF or Ovation systems to the up-to-date versions of Ovation.
  - DPU upgrade from OCR161 to OCR400 controllers
  - Control sheet change from AutoCAD to eCAD
  - MMI/PC upgrades to Windows7 (or WindowsXP)
  - Server upgrades to Windows Server2008 (or 2003)
- Emerson Q-line I/O twilight
  - Q-line I/O is scheduled to be dropped from Ovation SureService support in 2018
  - Emerson has an upgrade path for Q-line I/O card replacement which does not require any field wiring changes



# Ovation Upgrade

- There are two differing approaches being taken based upon schedule and budget
  - Incremental approach
    - Phase I - Evergreen
      - v2.2 to v3.3.1
      - OCR-161 controller to OCR-400
      - AutoCAD to eCAD
      - Win2k to Win7
    - Phase II – I/O Migration
      - Q-line to Ovation line I/O
  - All at once approach



# Ovation v3.3.1 Migration Plan

- NASA Glenn has adopted a multi-year plan to upgrade all four major facilities
  - 2010
    - PSL Evergreen
  - 2011
    - IRT Evergreen and I/O card migration
  - 2012
    - PSL I/O card migration
  - 2013+
    - 8x6/9x15
    - 10x10

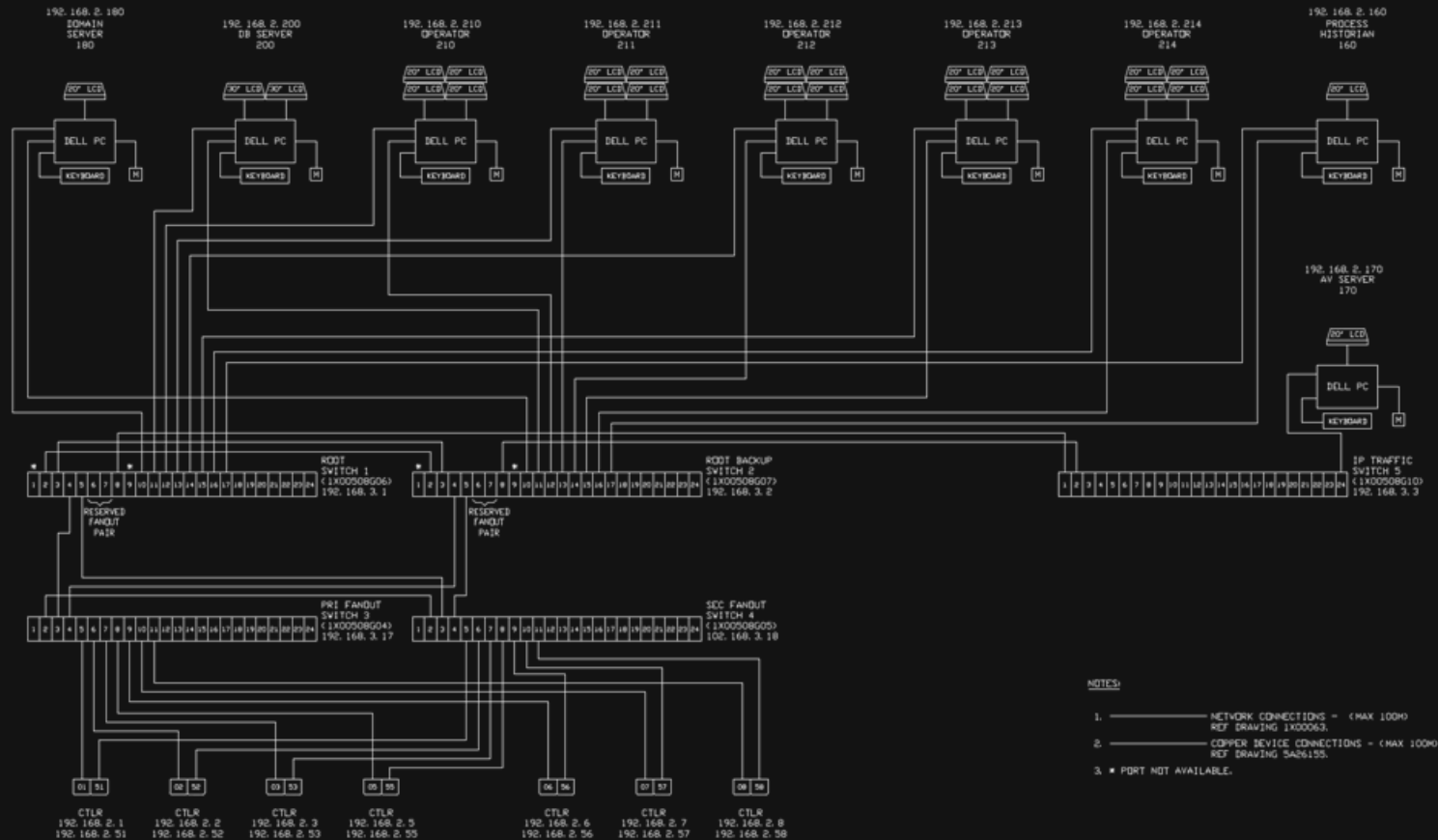


## Verification Plans

- Each facility will perform an Ovation system Validation Plan as part of the Evergreen process
  - Prudent due to control sheet changes
  - Validation Plan includes
    - Subsystem checkout
    - Integrated subsystems test
    - Full facility operation
- Each facility will perform end-to-end checks and subsystem checkouts as part of I/O card replacement
  - To ensure all I/O connectors to the field have been properly connected to new I/O cards



# PSL Ovation Network Configuration







# PSL Ovation Controller Upgrade

- Fully redundant controller pair
  - Dual Intel processors
    - PCI bus structure
    - Up to five process control tasks each with different loop execution rate
    - 128MB Flash & 128MB RAM
    - Four 10/100MB Ethernet NIC ports
  - Dual network interfaces
  - Dual processor power supplies
  - Dual I/O power supplies
  - Dual auxiliary power supplies
  - Dual input power feeds
  - Dual I/O interfaces

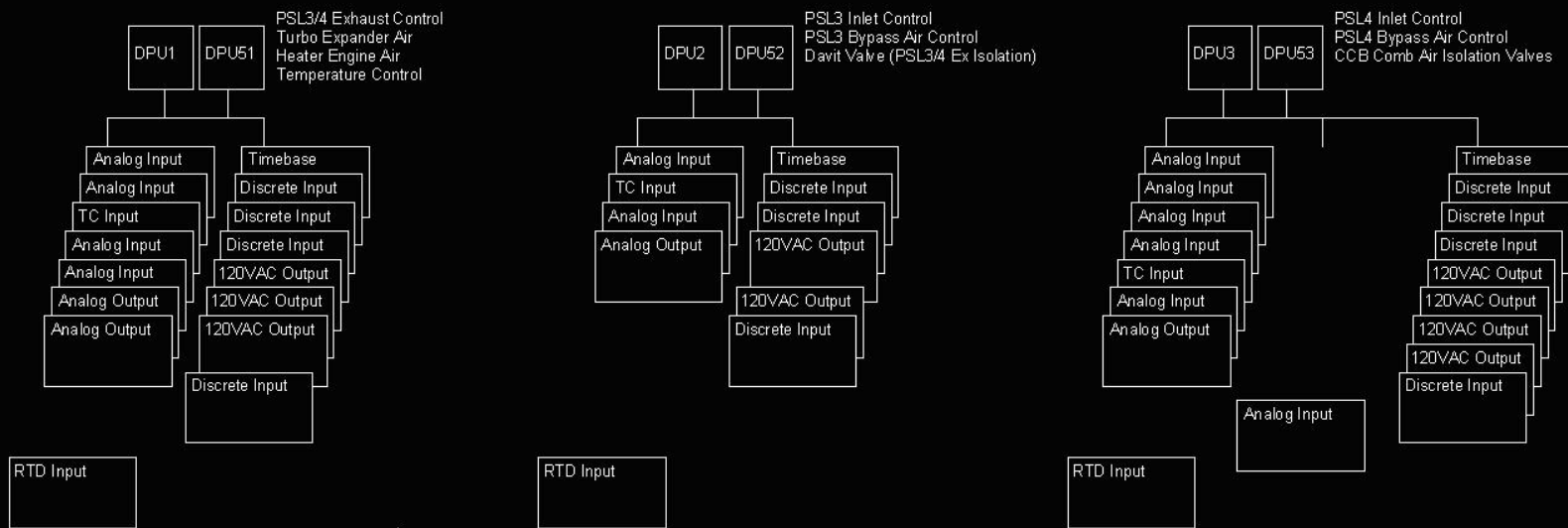


## Ovation 3.3.1 I/O Limits

- I/O capacity
  - Local I/O
    - Two sets of 8 branches of 8 Ovation I/O modules
    - Two nodes of 4 crates of 12 Q-line cards
  - Remote I/O
    - Eight remote nodes of 8 branches of 8 Ovation I/O modules
    - Eight remote nodes of 48 Q-line cards

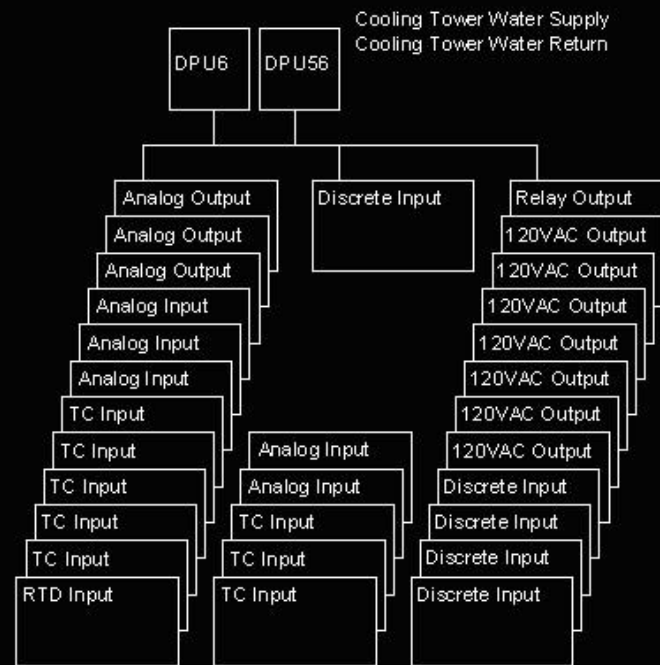
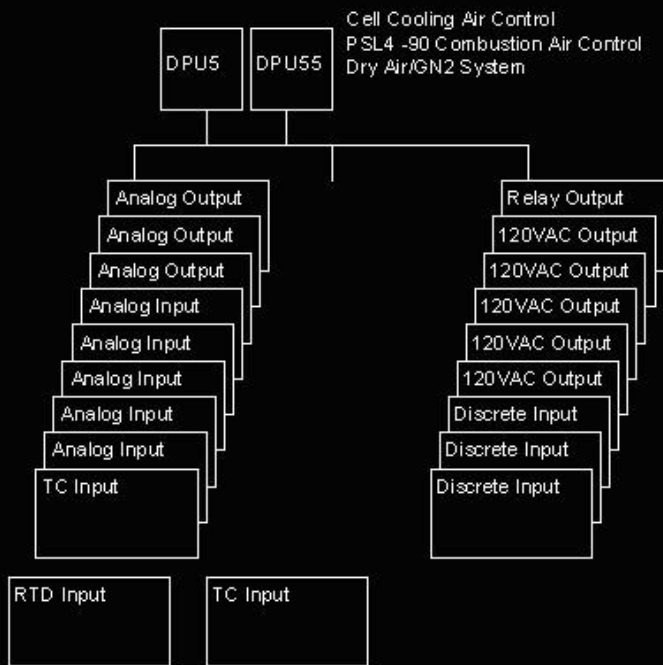


# DPU's 1/51, 2/52, & 3/53



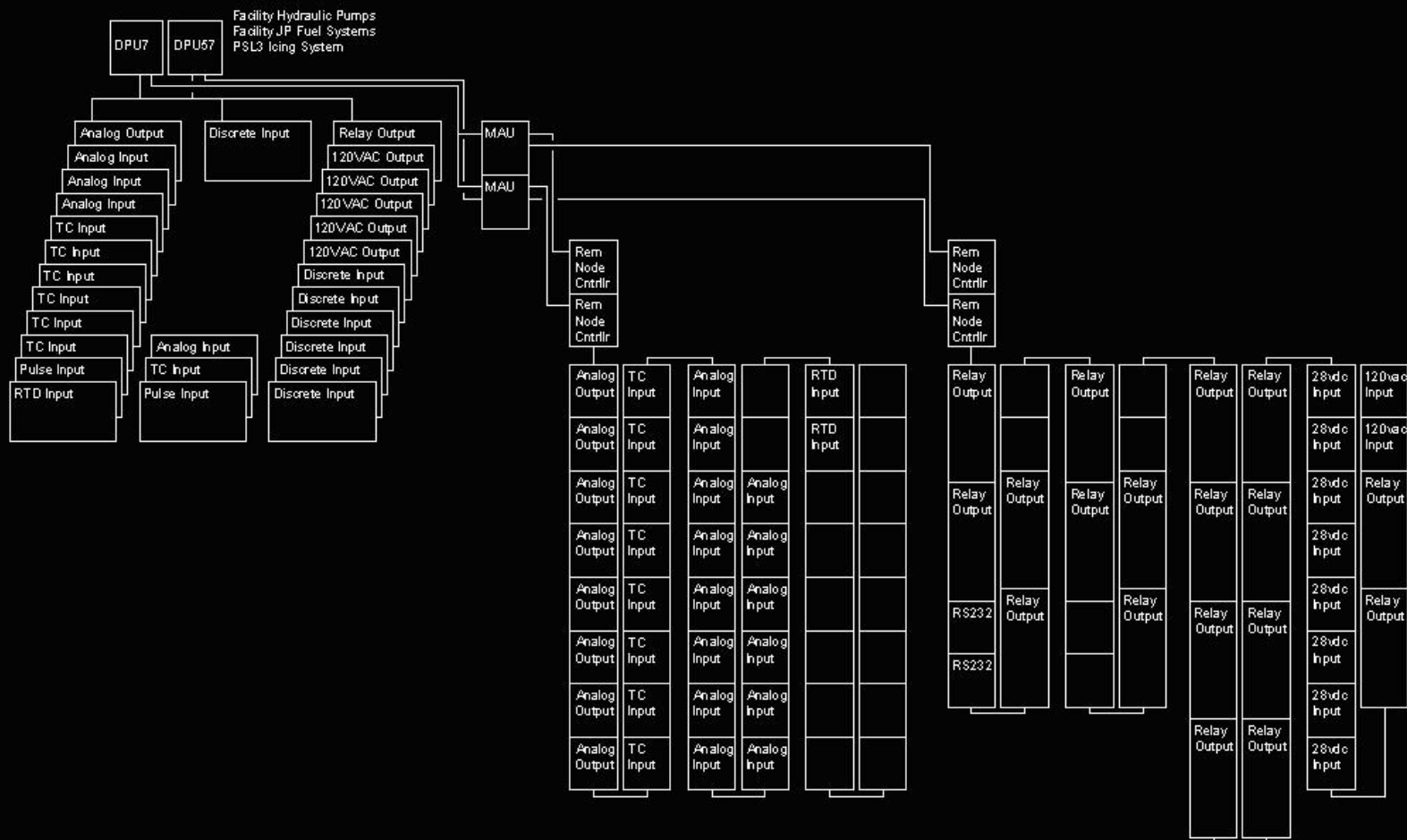


# DPU5 5/55 & 6/56





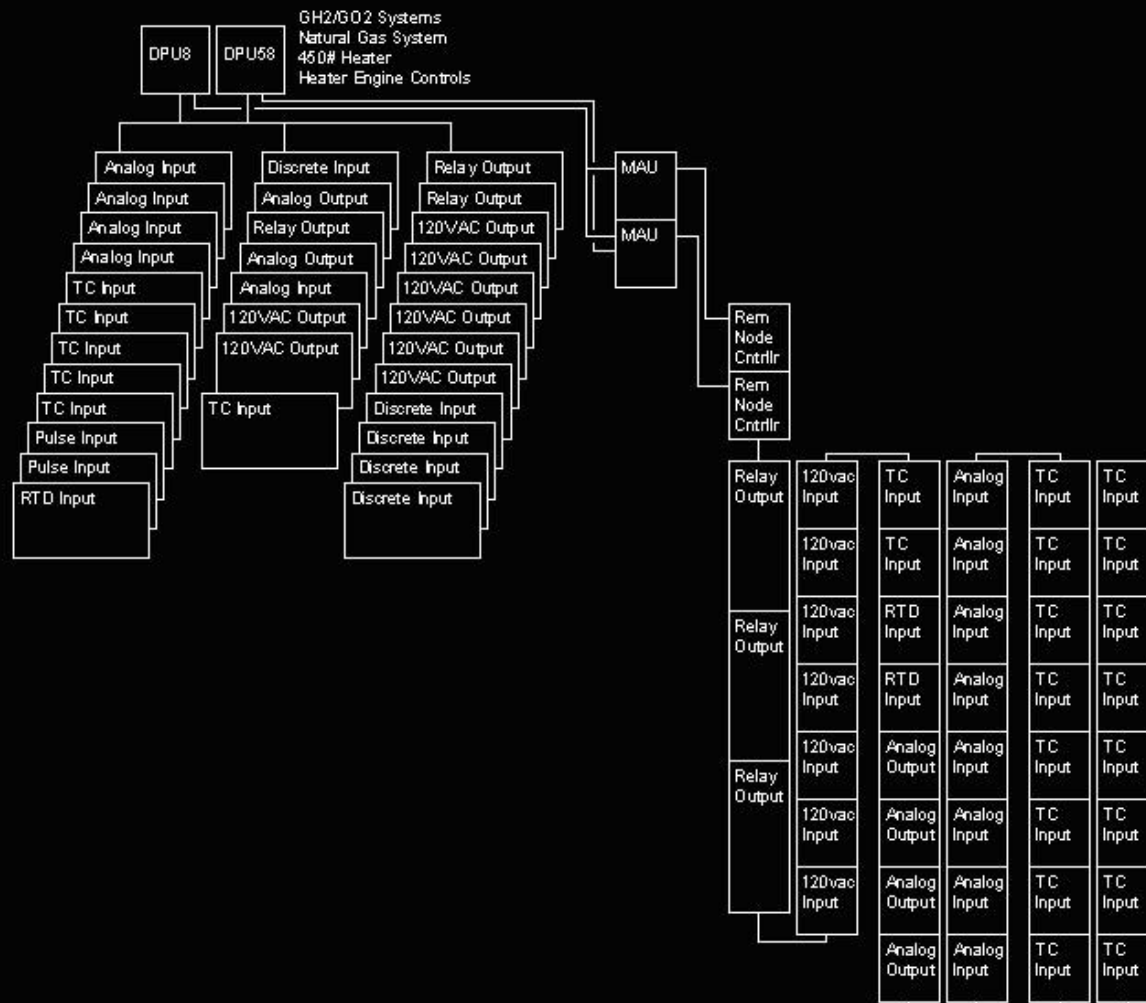
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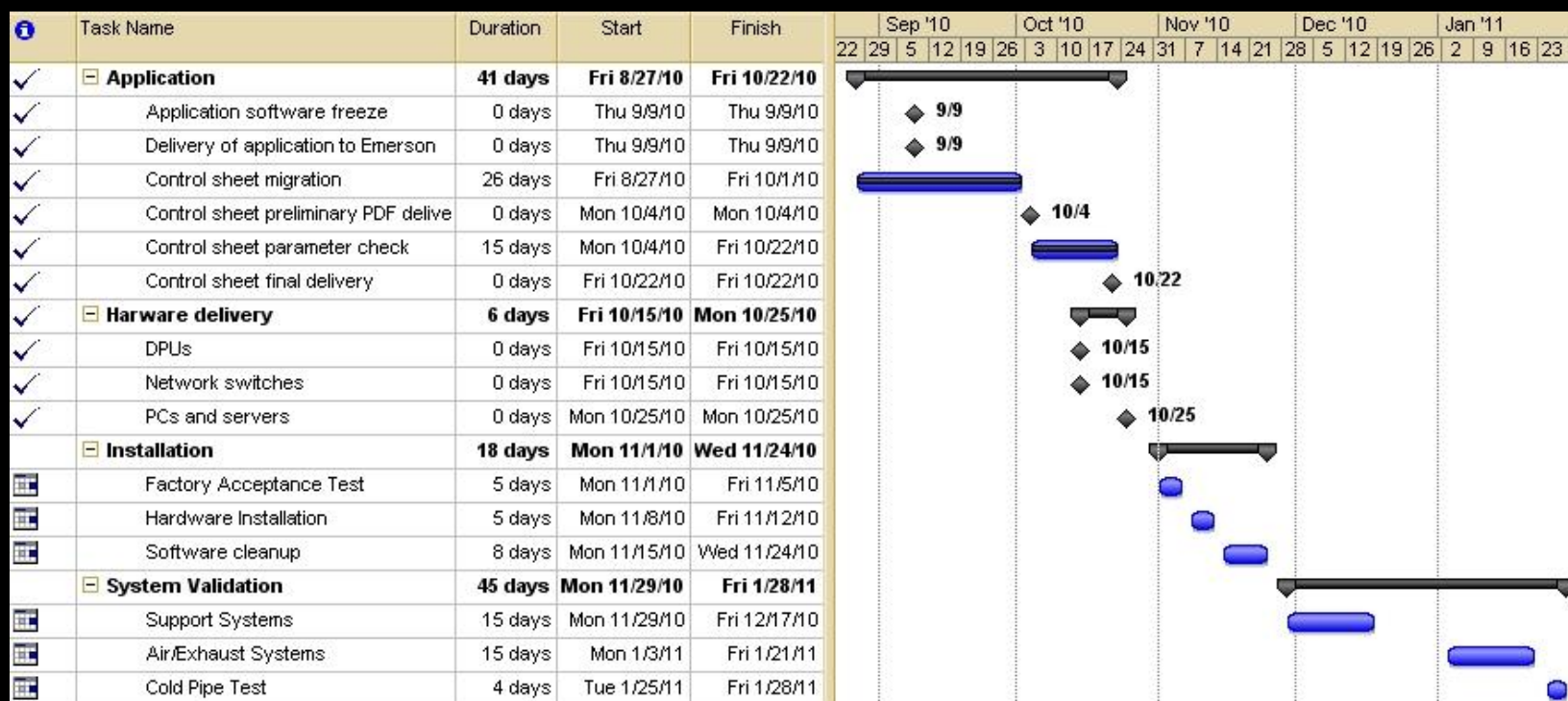


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# Schedule





## Questions?

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