



# 412<sup>th</sup> Test Wing



*War-Winning Capabilities ... On Time, On Cost*



**U.S. AIR FORCE**

## Virtual Architecture 101

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412 RANS**

**Approved for public release; distribution is unlimited.  
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*Integrity - Service - Excellence*



# Overview



- **Present Control Room Configuration**
- **Virtualization Overview**
- **GPUs**
- **Desktop**
- **Virtualization in the Control Room**



# Today's Control Room





# Control Room Model



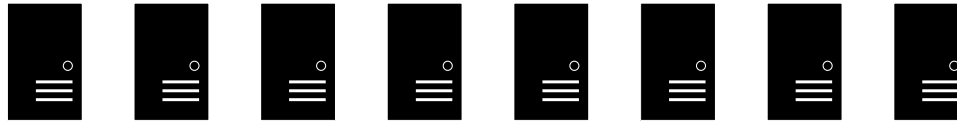
Telemetry Processor



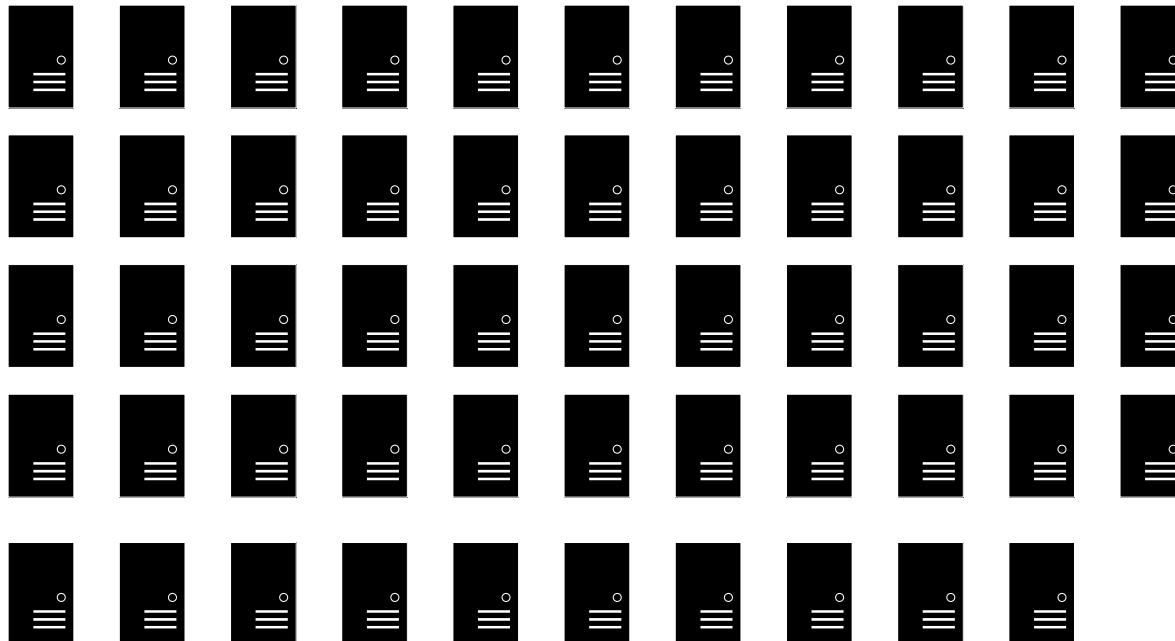
Video Switch



8 Servers



54 Workstations

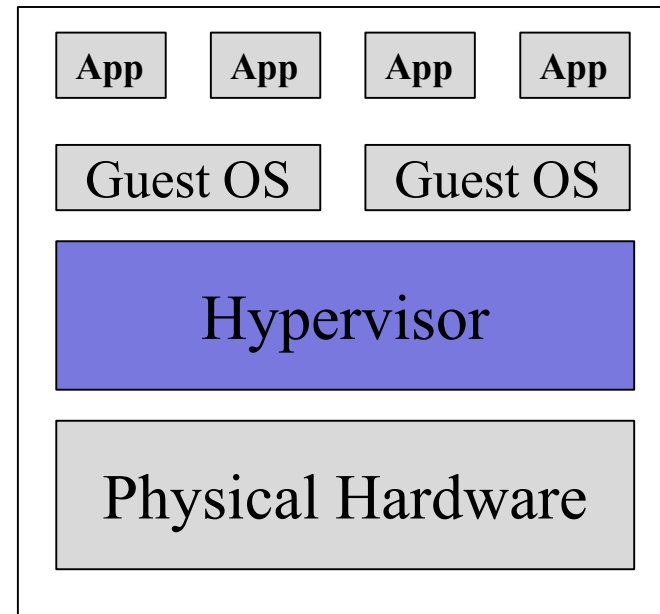
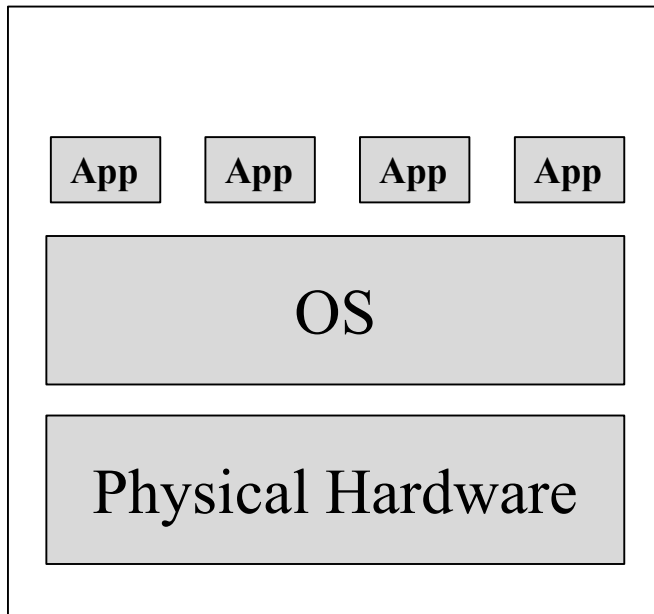




# Physical Vs Virtual



- Virtualization is the decoupling of operating system from the hardware

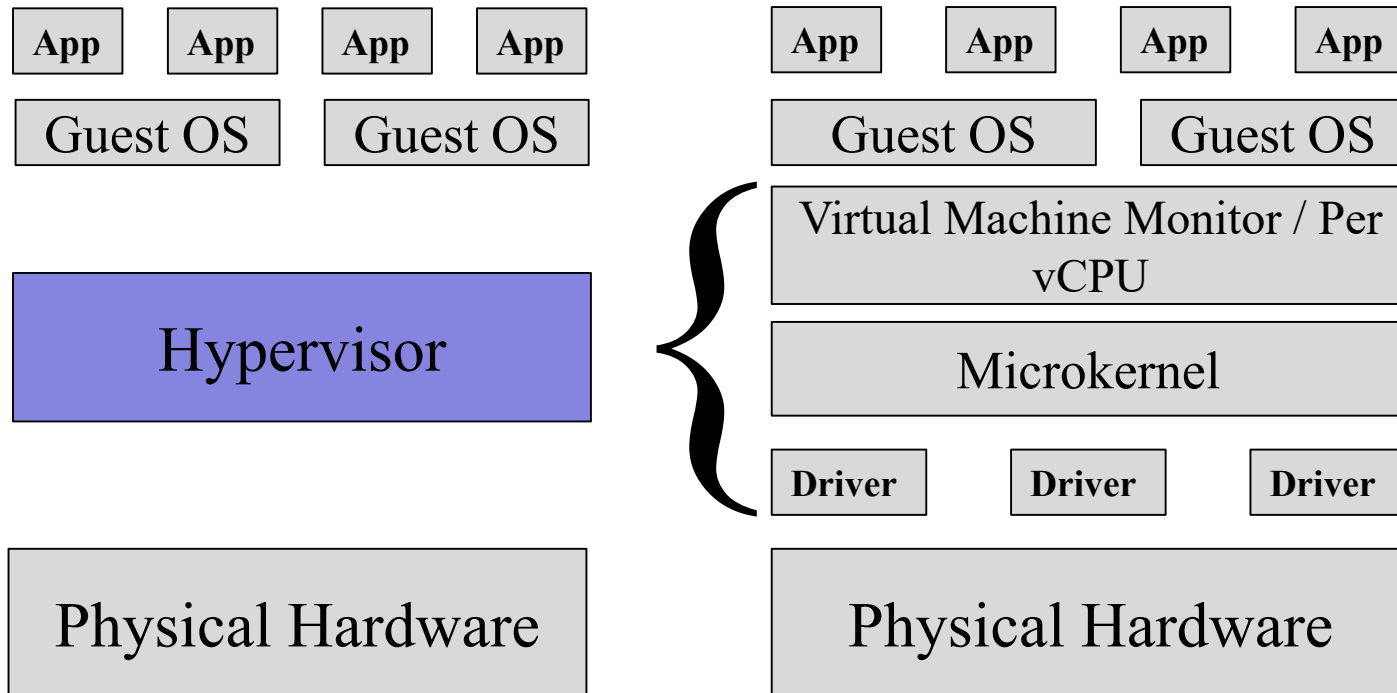




# One Level Deeper



The hypervisor is the interface between the guest operating System and the layer below

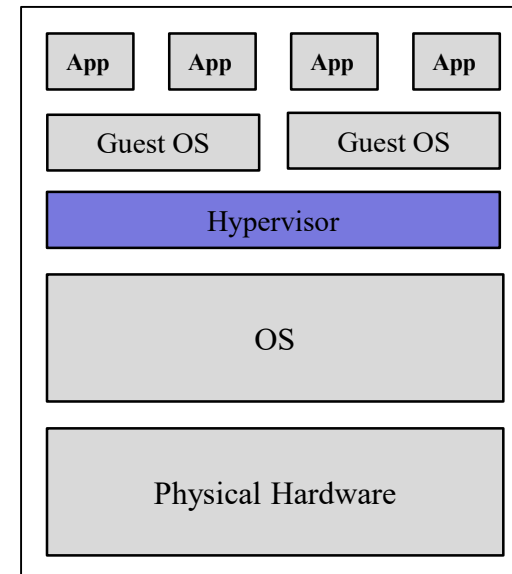
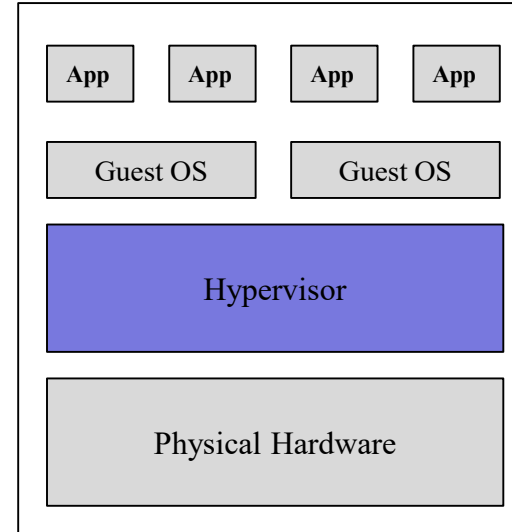




# Hypervisor Types



- **Two types of Hypervisors:**
  - **Type 1: Bare Metal**
    - VMWare ESXI,
    - Microsoft Hyper-V,
    - Citrix Xen Server
  
  - **Type 2: Hosted**
    - VMWare Workstation
    - Oracle VirtualBox

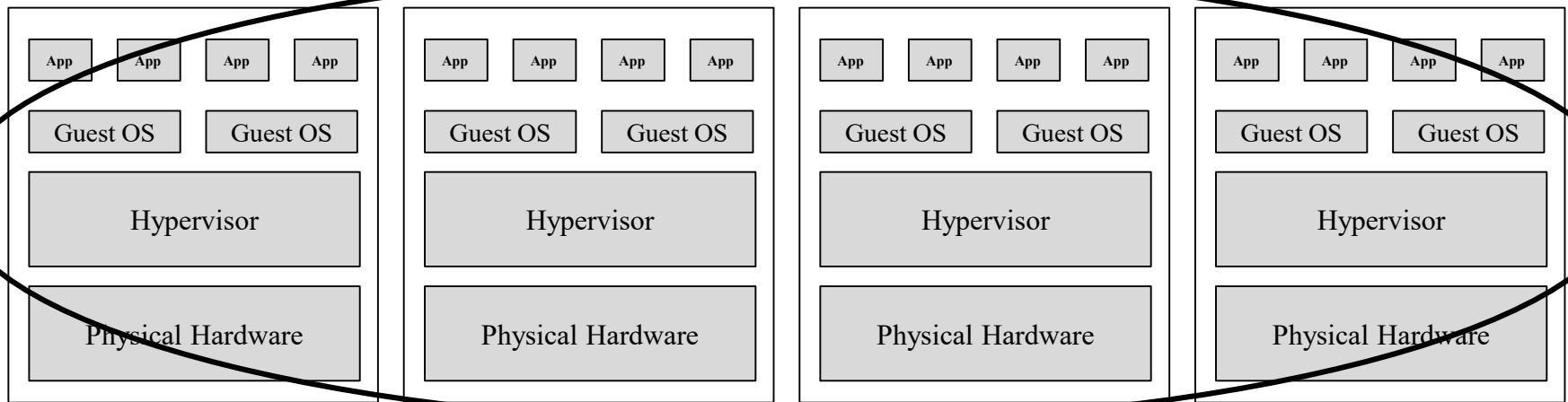




# Cluster



- **Clusters create a fault tolerant high availability infrastructure**
- **The virtual network is a component of the cluster**



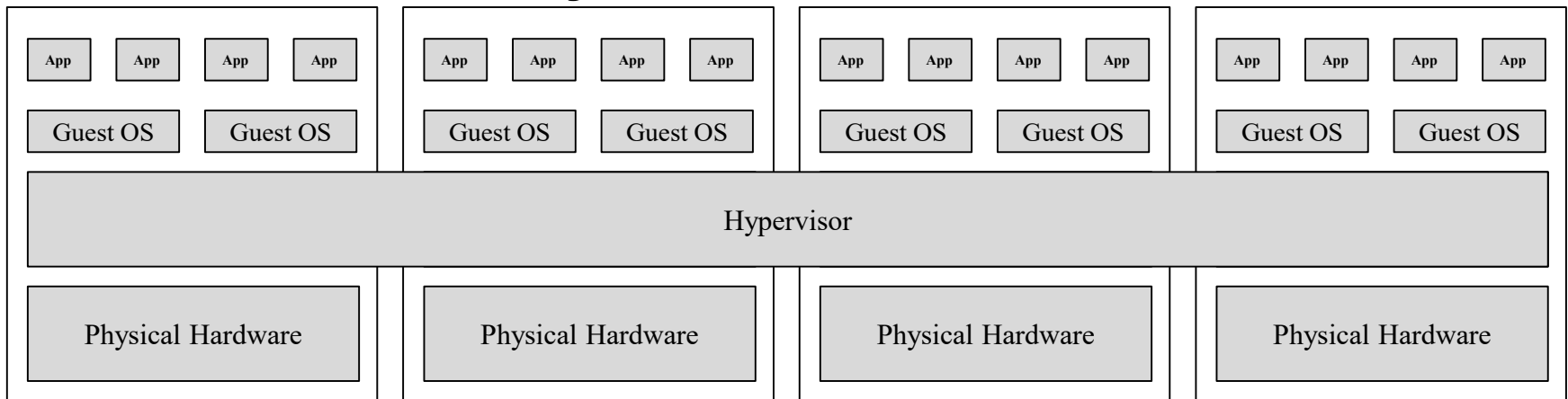




# Hyperconvergence



- The industry term which describes the tight integration of computing, storage, and networking resources
- Resources are now resource pools
  - Cores, memory, graphics, storage
- Management tools are now integrated and necessary





# Virtualization Considerations



- **Old model: OS drivers support hardware**
- **New model: hypervisor support required**
  - **Compatibility matrix**
  - **CPU support of virtualization**
  - **Graphics support**
  - **Storage**



# Graphics



- **3D graphics**
- **CUDA processing**
  - **Parallel processing to the user**
- **Passthrough**
  - **Entire card goes to one user**
- **Fractional card**
  - **vGPUs allocated to users**
  - **1, 2, 4, 8, 16 vGPUs per real GPU**



# Desktop Equipment



- **Sending video (only) to the desktop over the network**
- **GPU acceleration optional**
  - From inside the VM (not at the desk)
- **Several protocols available**
  - Teradici PCOIP
  - Microsoft RDP
  - Citrix HDX
  - VMWare BLAST



# Desktop Equipment



- **Zero client**
  - Video only
  - Infrequent updates
- **Thin client**
  - Small OS
  - Video + application + storage
  - Medium updates
- **Thick client**
  - Full PC
  - Transition
  - Plenty of updates





# Storage



- **Persistent Storage**
  - Desktop changes kept day to day
  - Offline processing
  - Conventional office desktop
- **Non Persistent Storage**
  - Every startup reset back to the original state



# Security



- **All clients can use the same image**
  - Changes rolled out faster
- **Security of guest OS is improved**
  - Hypervisor security
- **Zero clients have no storage**



# Control Room Lab Environment



- **System studies in process**
- **Testing real time processing**
- **Testing off line processing**
- **Testing office tools**





# Appliance Resources



## Appliance

- 160 Processor CPUs
- 4 Graphics GPUs
- 6 TB Memory
- 184 TB Storage
- Virtual network





# Implemented Resources



## Status

- 4 physical machines
- 6 (12) servers
- 11 (50+) simultaneous clients





# Implemented Functions



## Goal

- Software Decom
- IADS CDS
- APS (MCS and IADS)
- Video Support
- Soft RMOR
- PCM Simulator
- Situational Awareness
- Software Recording

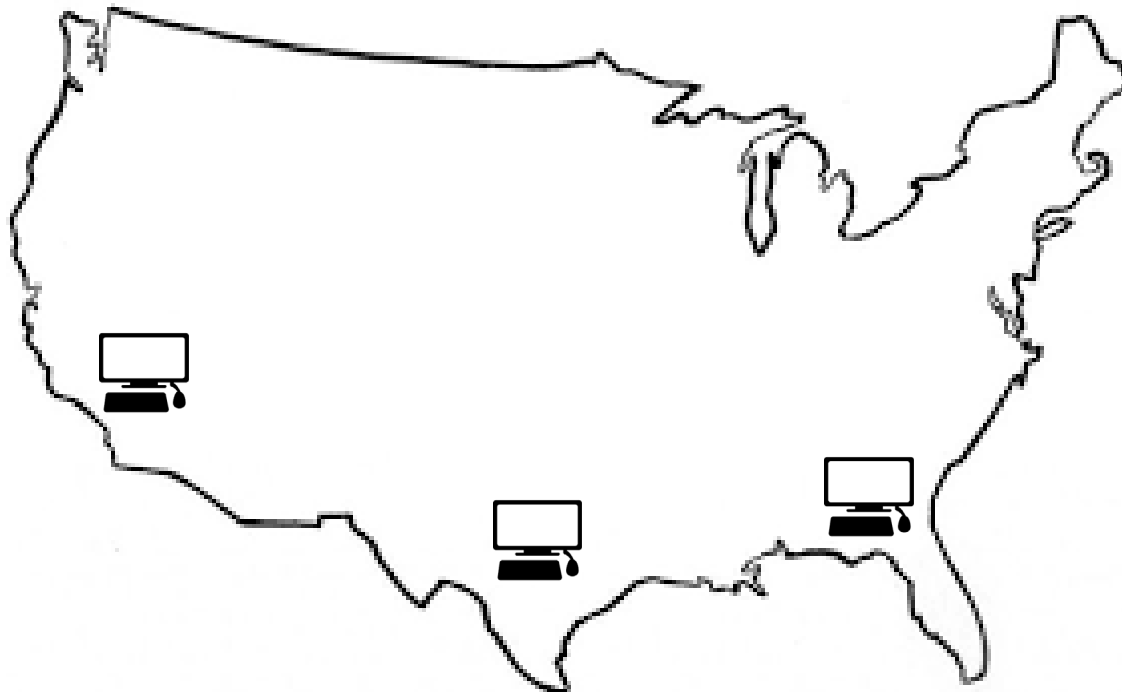




# Distributed Test



- **Hardware at one location**
- **Desktops at several locations**
- **Only limited by network connectivity**





# Questions

