RIG

Reconfigurable Image Generation System

Why an Eye Limiting Display Resolution Matters How to Achieve It

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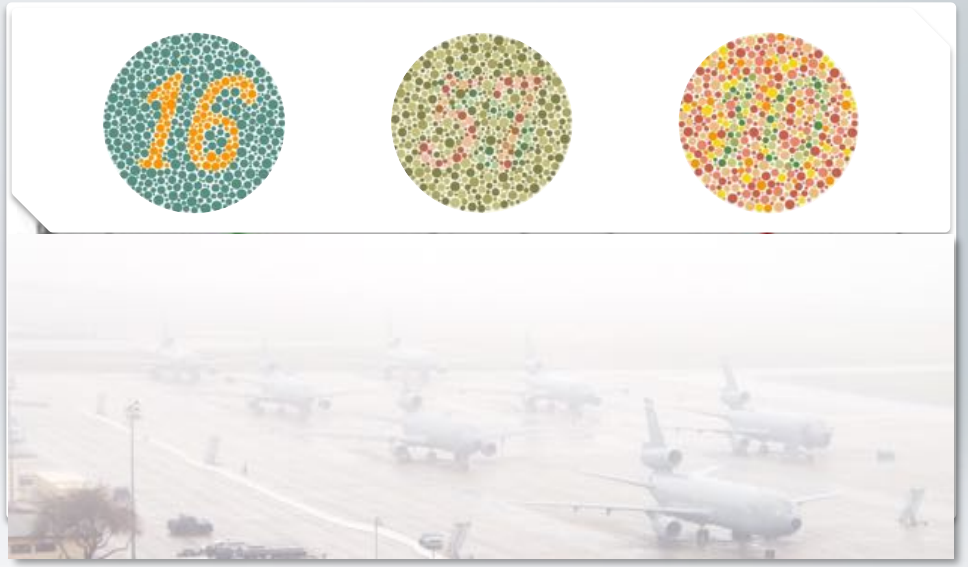
Genesis of the RIG

- Operationally Based Vision Assessment (OBVA)
- Study Human Vision and Testing Standards in Operationally Relevant Test Environments
  - Collaborative effort between NASA Ames and Air Force Research Laboratory (AFRL)
  - USAF School of Aerospace Medicine (USAFSAM) Sponsored Research Project

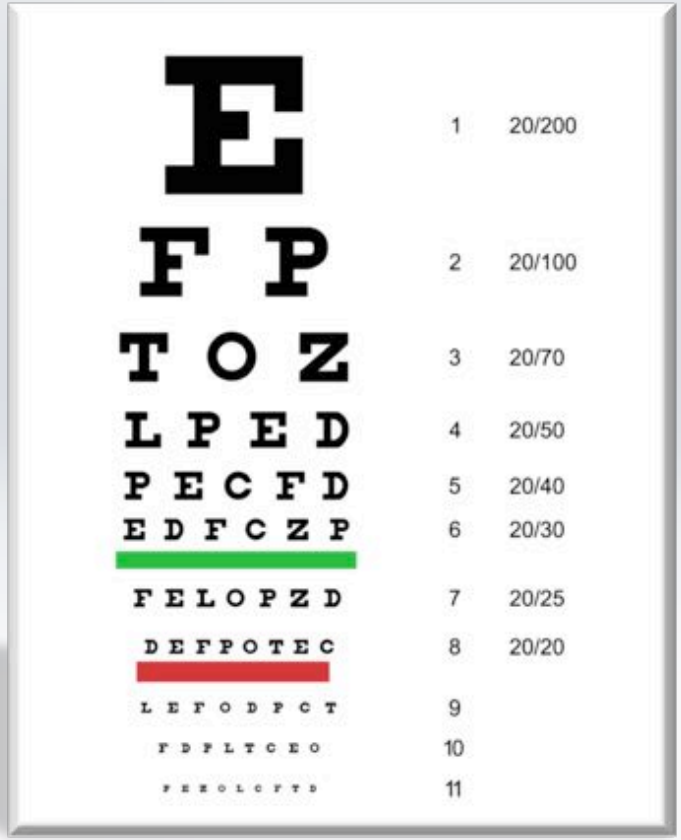
Background

- Young USAF pilots have an average of 20/13 visual acuity
- Average FAA flight simulator today has a visual acuity of 20/40



- Most vision testing focus on acuity, while color and contrast differential testing are limited at best

Eye Test vs. Real World



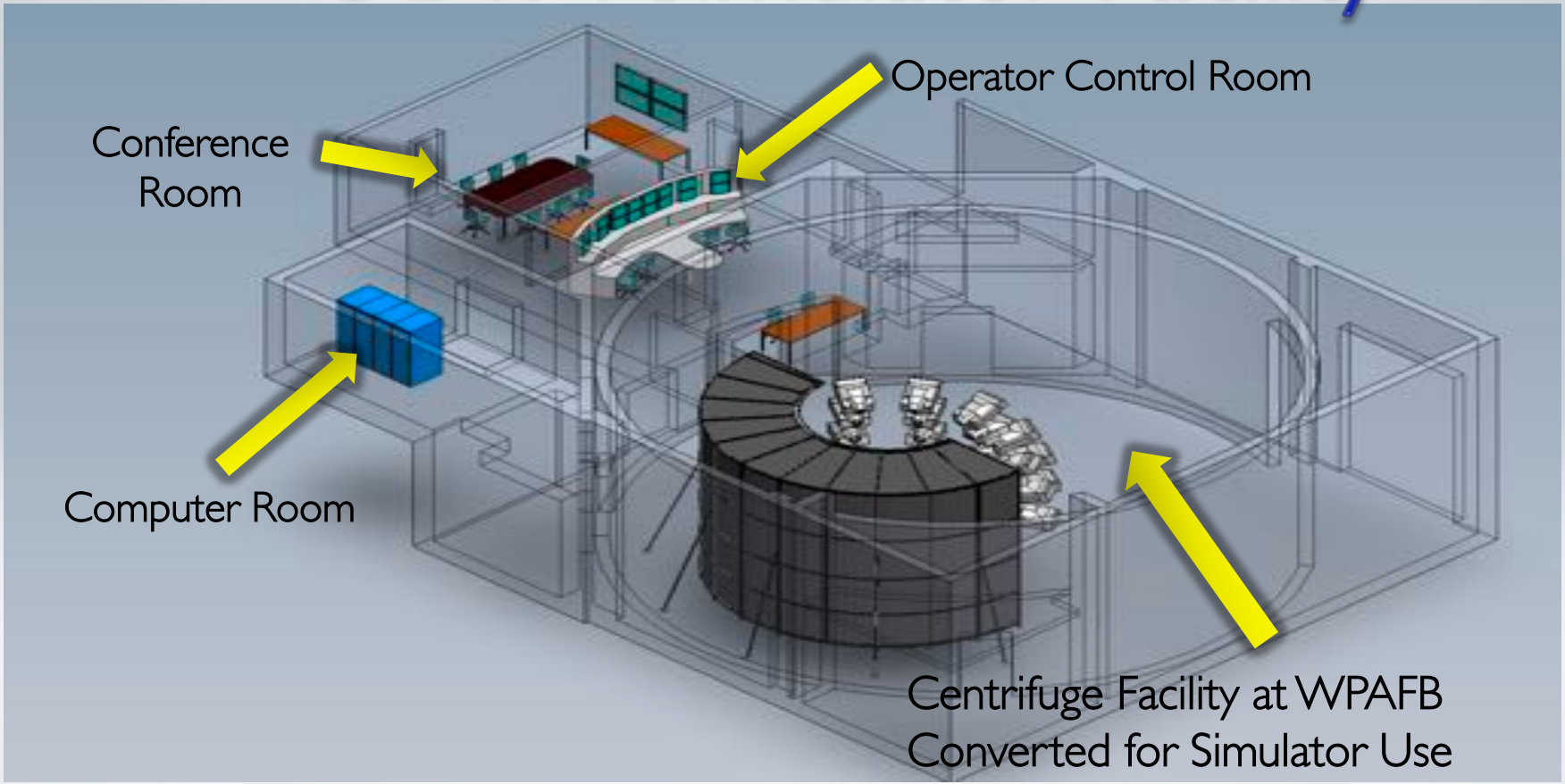

MAYFLOWER


20/10
Relax.
Go Nuts.
Share Moments. Share Life.
Kodak
MAYFLOWER
20/40

Eye Limiting Visual System

- To achieve 20/10 visual acuity we designed a 150 megapixel simulation environment
  - 20,480 x 7,200 pixels in a 4 meter spherical dome
  - Max ~160° horizontally and ~60° vertically
- 6000 lumen brightness
- Color space meets or exceeded aviation RGB
- 60 Hz refresh rate minimum
  - Capable of 120 Hz to minimize motion artifacts

OBVA Simulator Facility

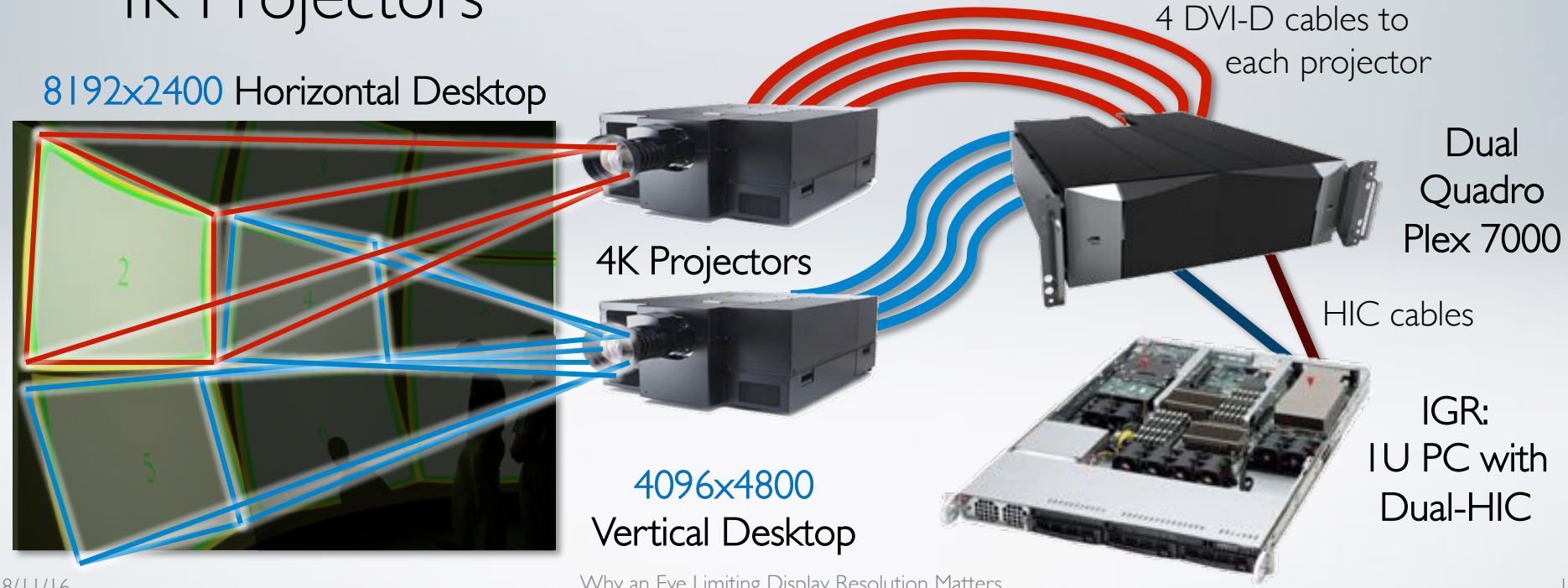


Display Subsystem

- 15 True 4K (4096x2400) projectors
- 5x3 Grid Array
- Design to supports up to 25 projectors

One BIG Desktop

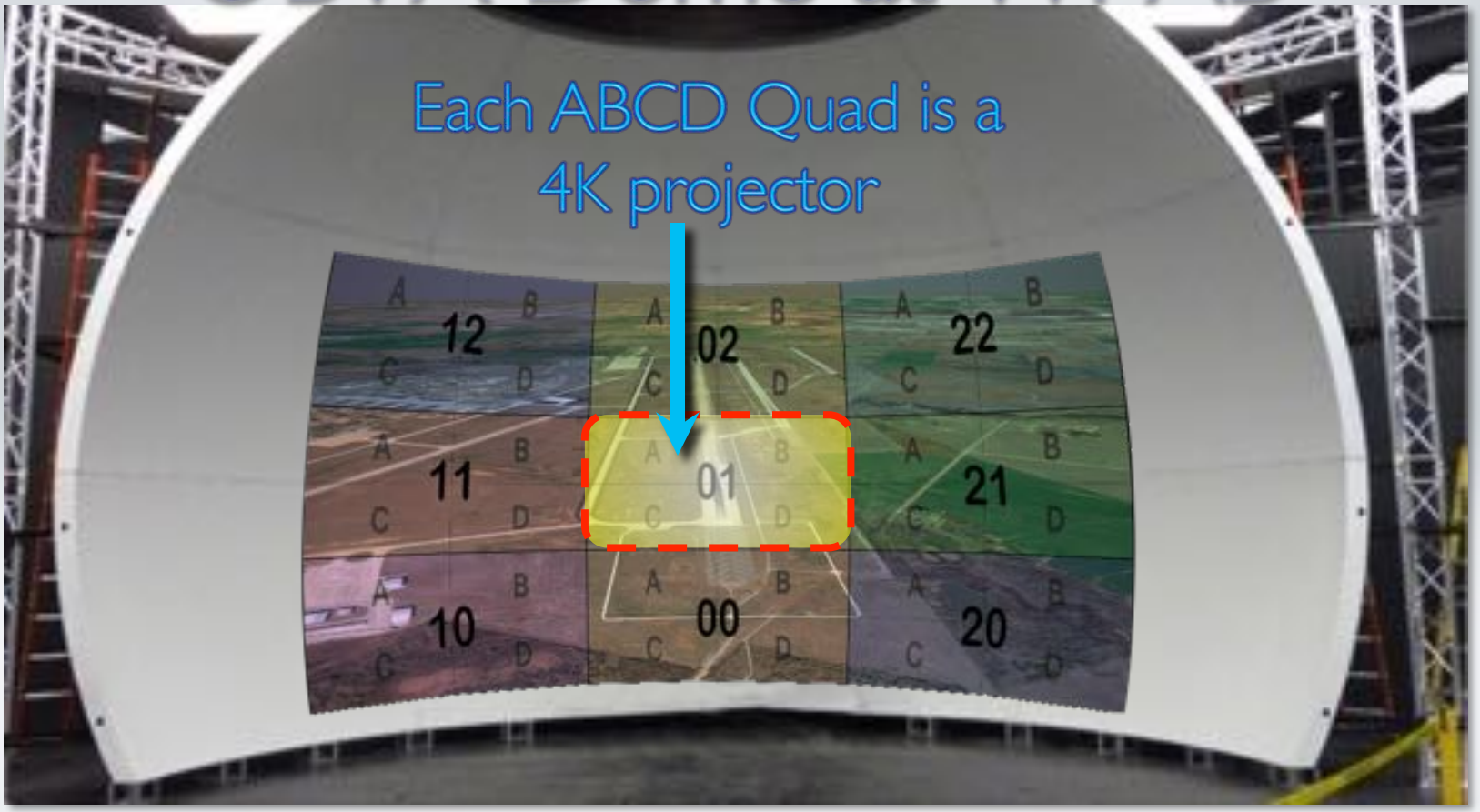
- Each Out The Window IGR Can Drive Two 4K Projectors



OBVA Sim at WPAFB

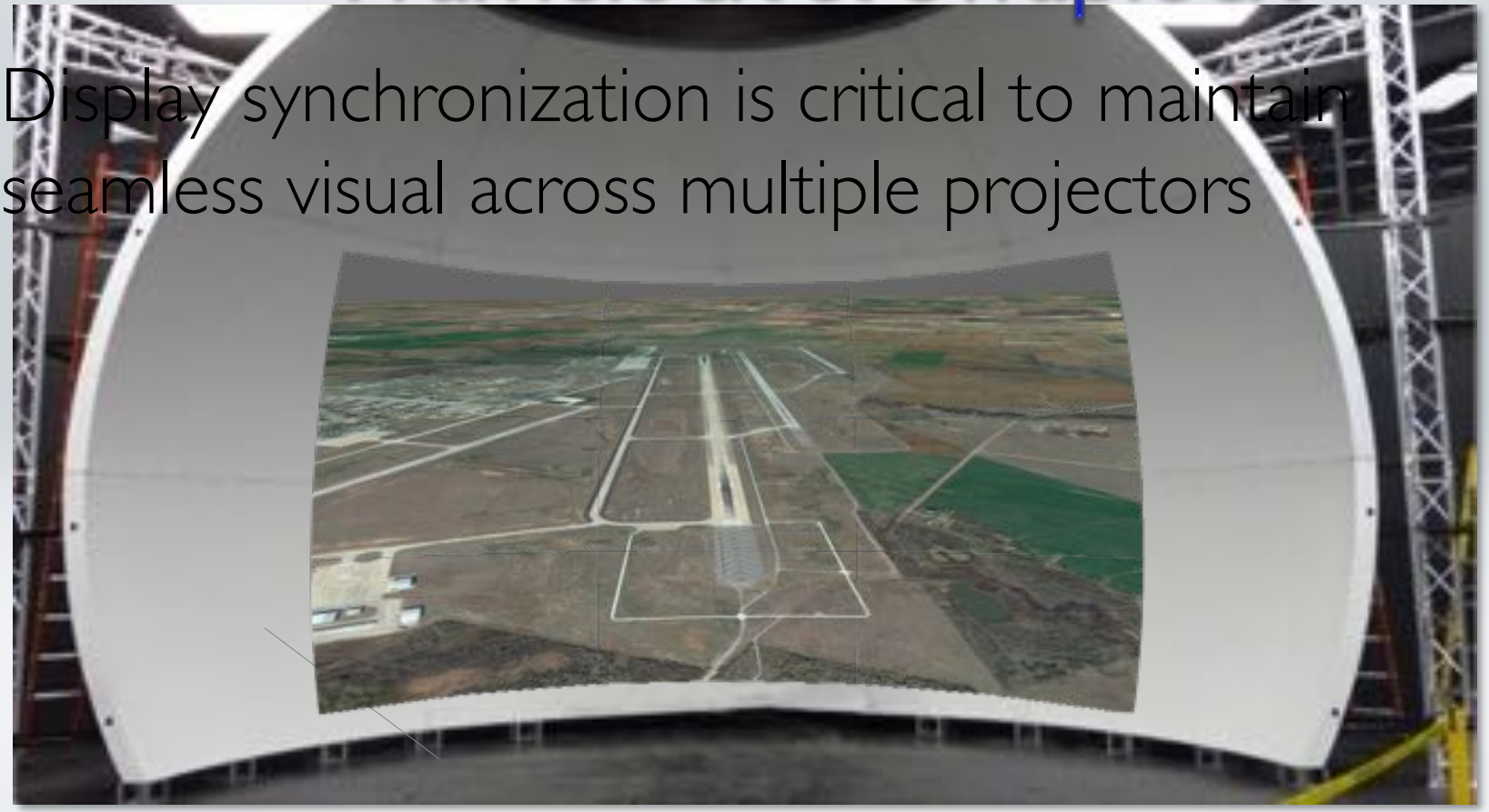
OBVA Dome at WPAFB

OBVA Dome at WPAB



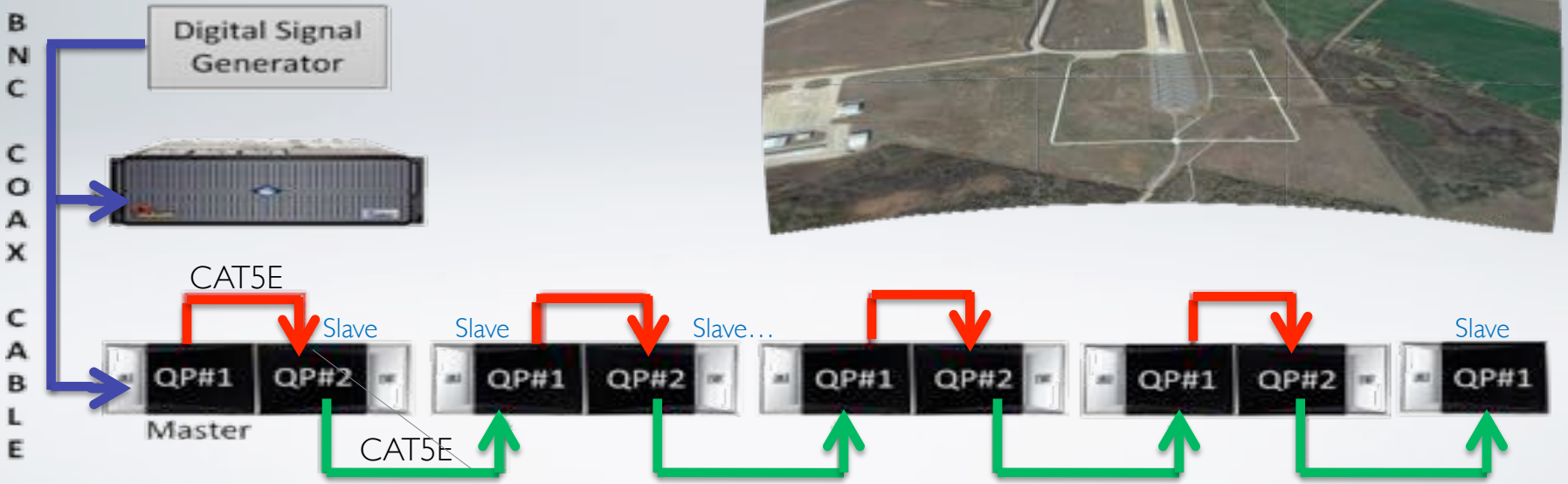
Framelock & Swaplock

- Display synchronization is critical to maintain seamless visual across multiple projectors



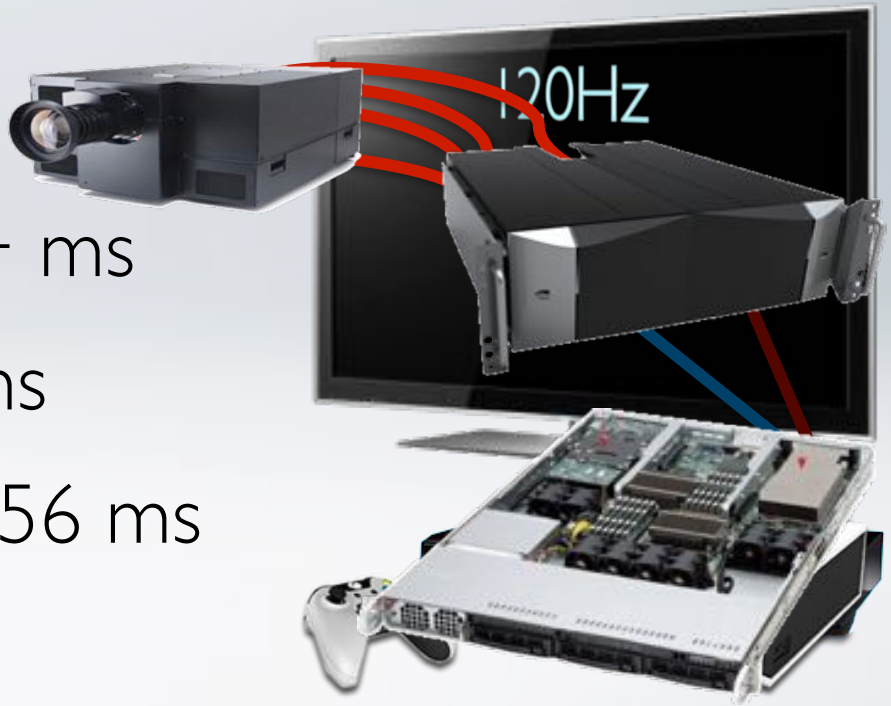
Framelock & Swaplock

- Nvidia G-Sync II
  - Host and IG synced from master digital signal clock



Latency Matters

- Low system latency is critical to interaction
  - Refresh rate is NOT latency!



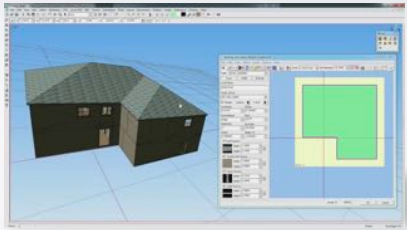
- Home Theater 100-500+ ms
- Video Games 80-300+ ms
- RIG Setup for OBVA 20-56 ms

RIG Visualization Software

- IG Manager (IGM) Application
- IG Renderer (IGR) Applications
  - Windows 7 Ultimate 64-bit Operating System
  - RIG Out-the-Window built on:
    - NVIDIA SceniX SDK scene manager (OpenGL)
    - Scalable Display Technologies Easyblend SDK for distortion correction and edge blending
    - Sundog SilverLining Atmosphere Special Effects SDK

RIG Database Generation System

- RIG-DBGS Tools allow for semi-automated terrain database generation
  - Take advantage of multiple data sources:
    - High resolution aerial and satellite imagery
    - 3D elevation data sets
    - Vector and GIS data sets
  - Utilizes Google Earth Pro & Presagis Creator Pro
- 3D cultural features interoperable with existing OpenFlight databases



Results: 20/10 Visual Acuity

Questions?