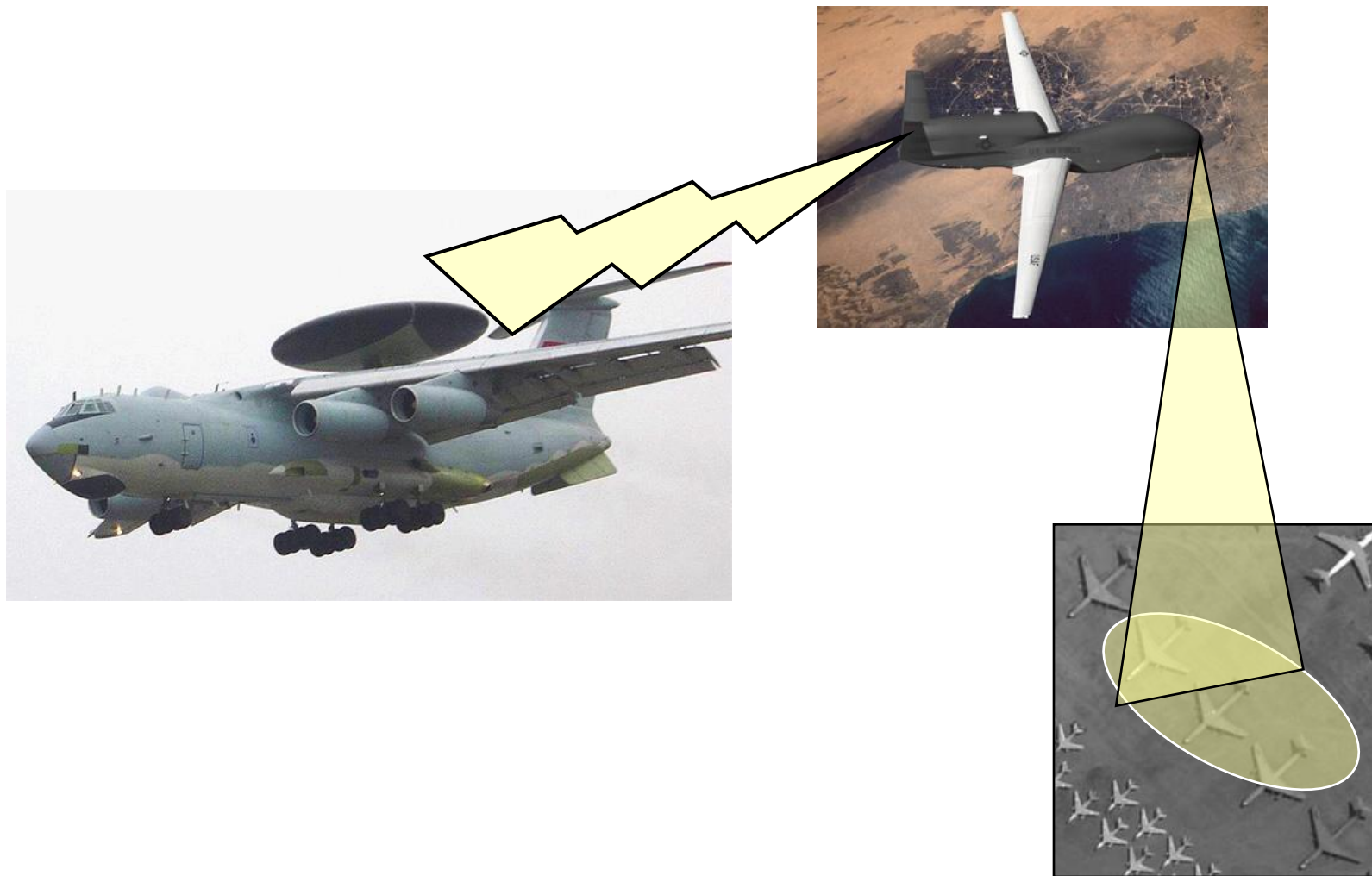


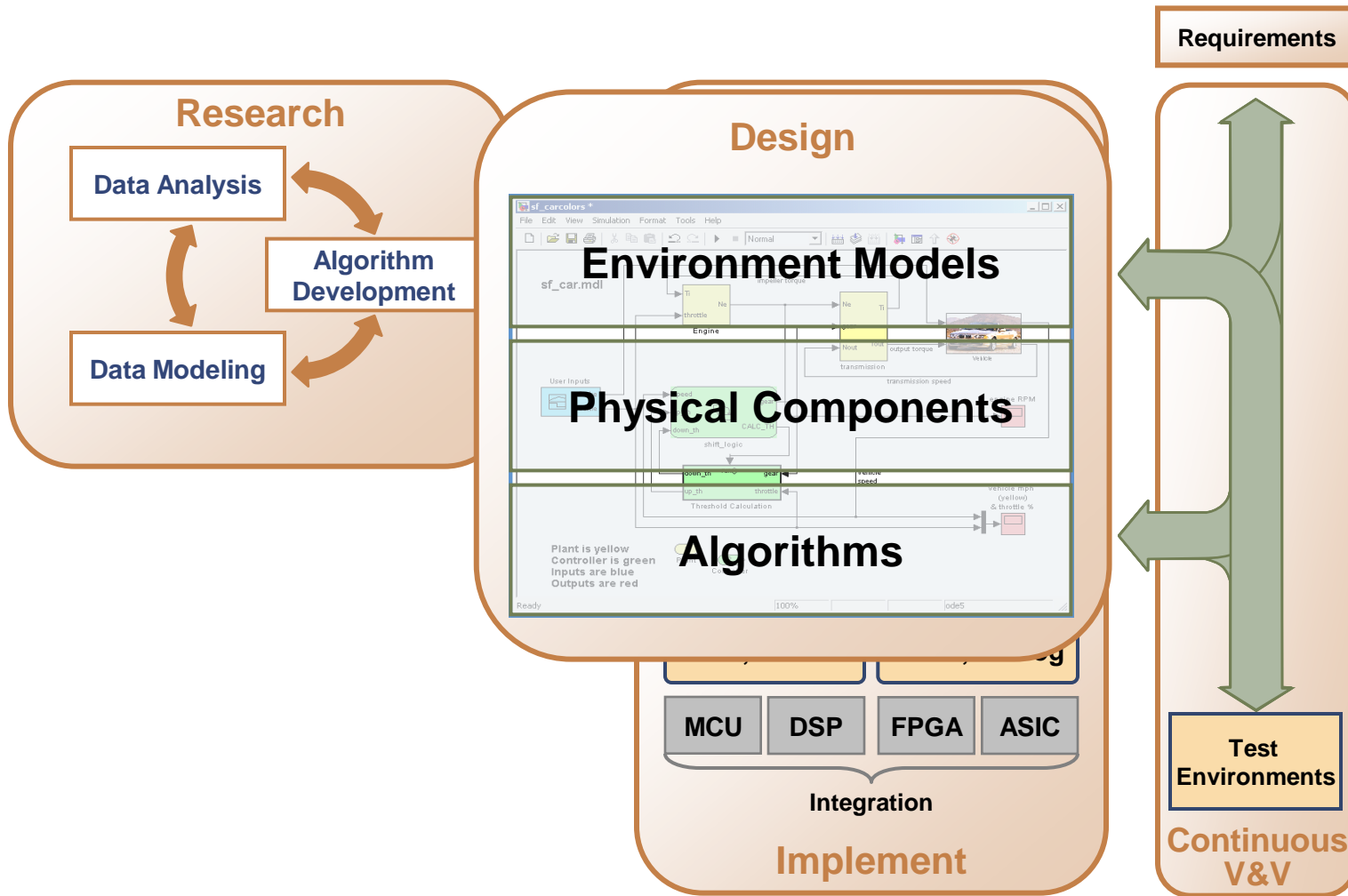
Developing Communications and ISR Systems Using MATLAB® and Simulink®

Kerry Schutz
Application Engineer

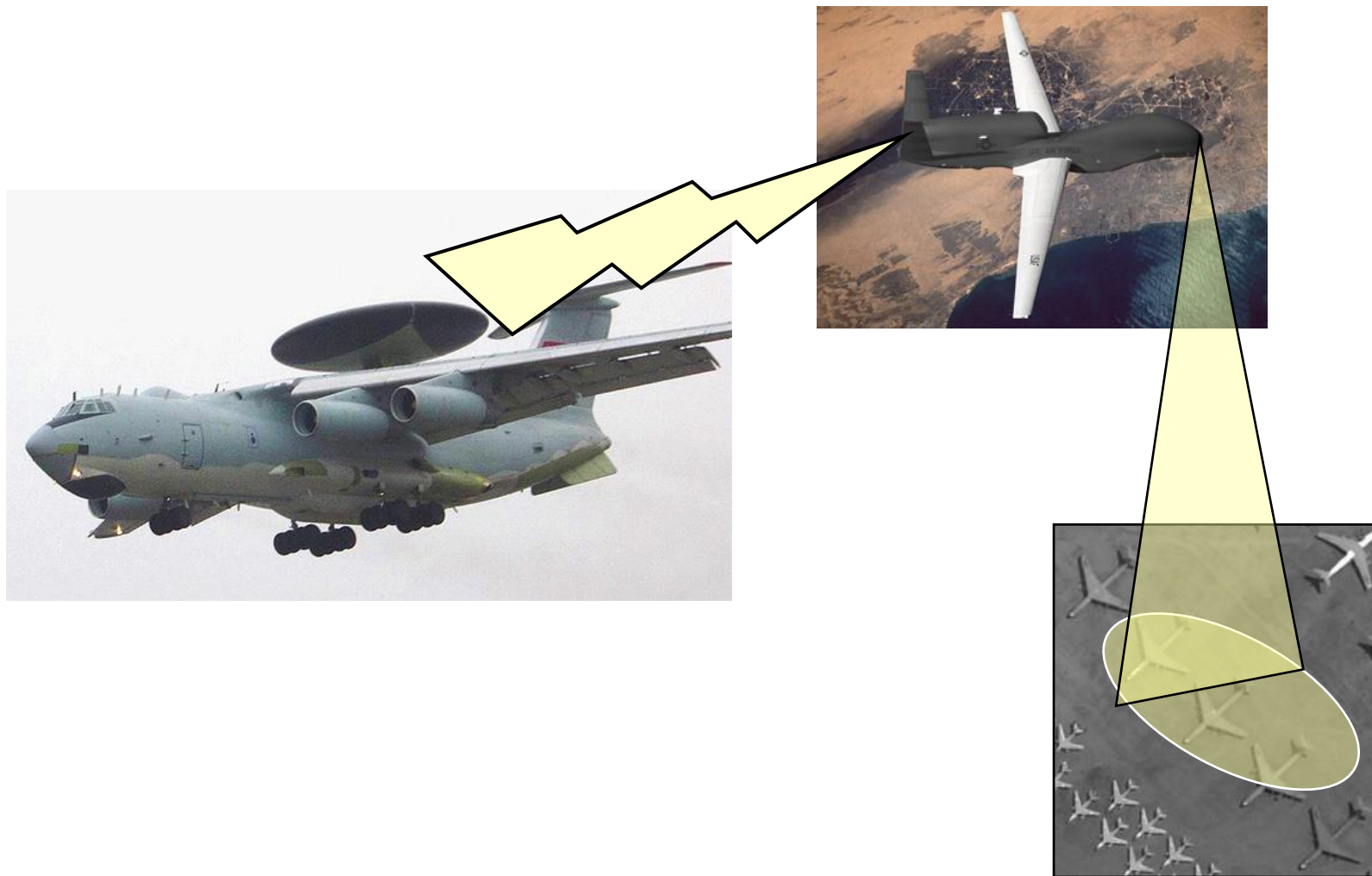
UAV-based Communications and ISR



Model-Based Design Workflow



UAV-based Communications and ISR



Design and Integrate a Video Communications System for a UAV

- Design and simulate 3 different system components
 - Antenna pointing control
 - Communications link
 - Video codec and post-processing
- Integrate the components to evaluate overall impact on system performance



Core MathWorks Products

SIMULINK®

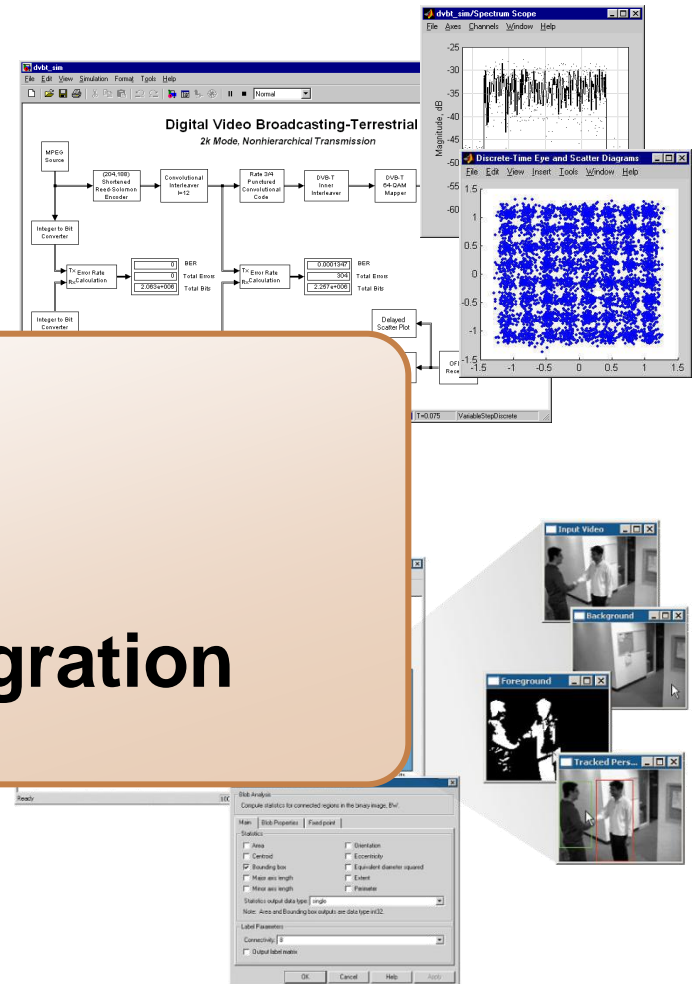
The leading environment for modeling, simulating, and implementing dynamic systems

- Foundation for Model-Based Design

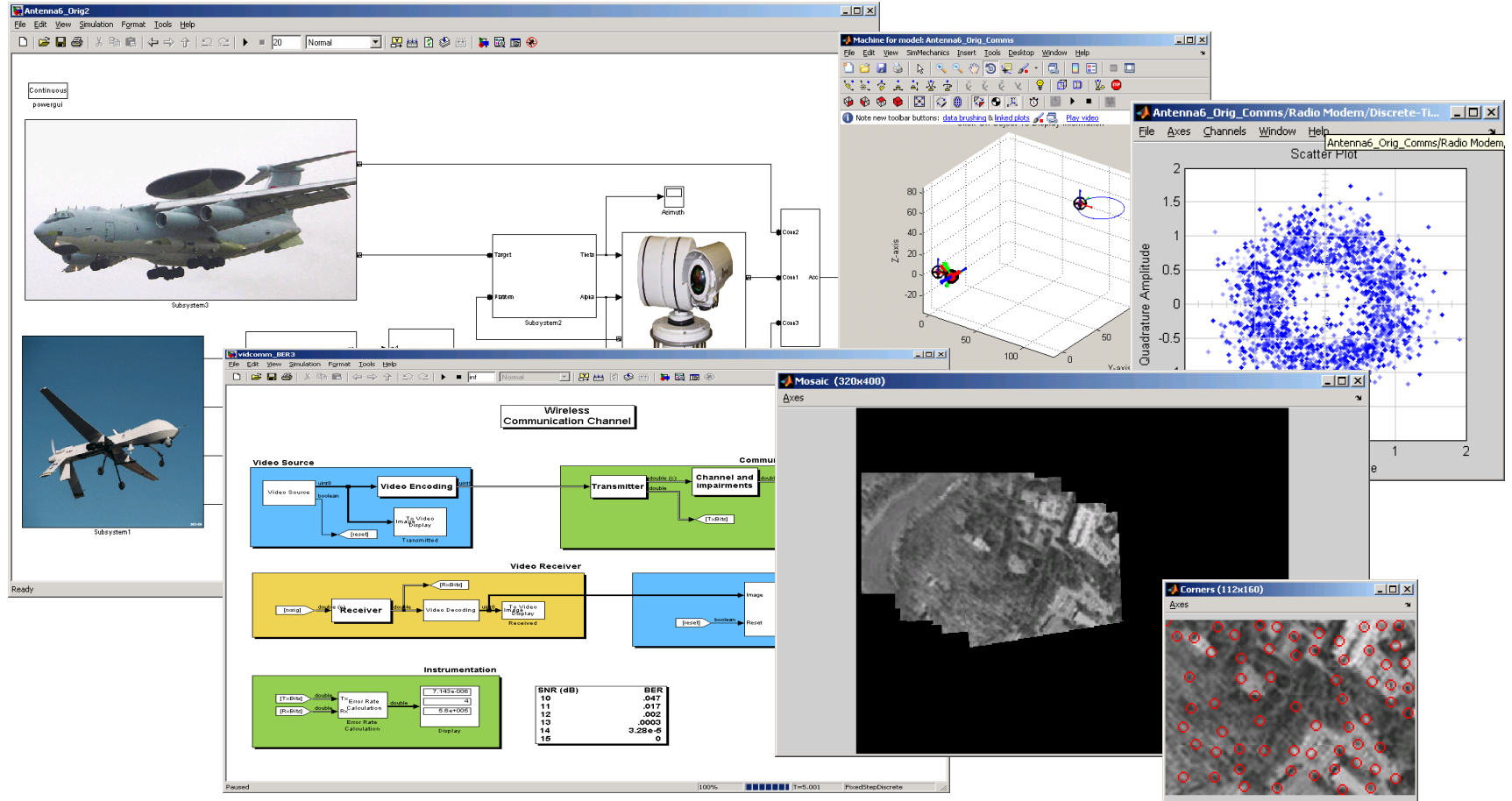
▪ Multi-Domain Modeling

▪ Platform for System Integration

- Open architecture with links to third-party modeling tools, IDEs, and test systems



Demonstration

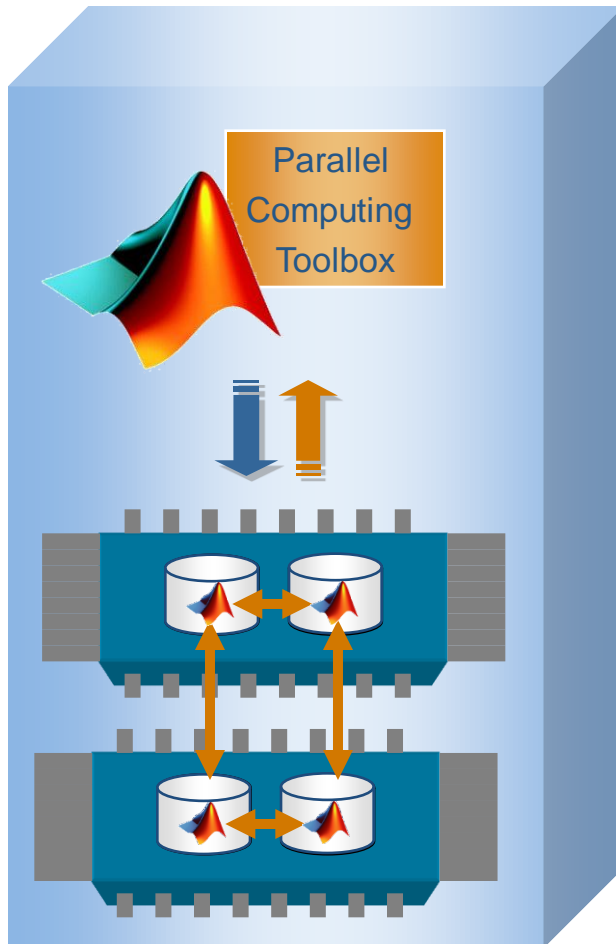




Low Bit Error Rate and Other Intensive Computations

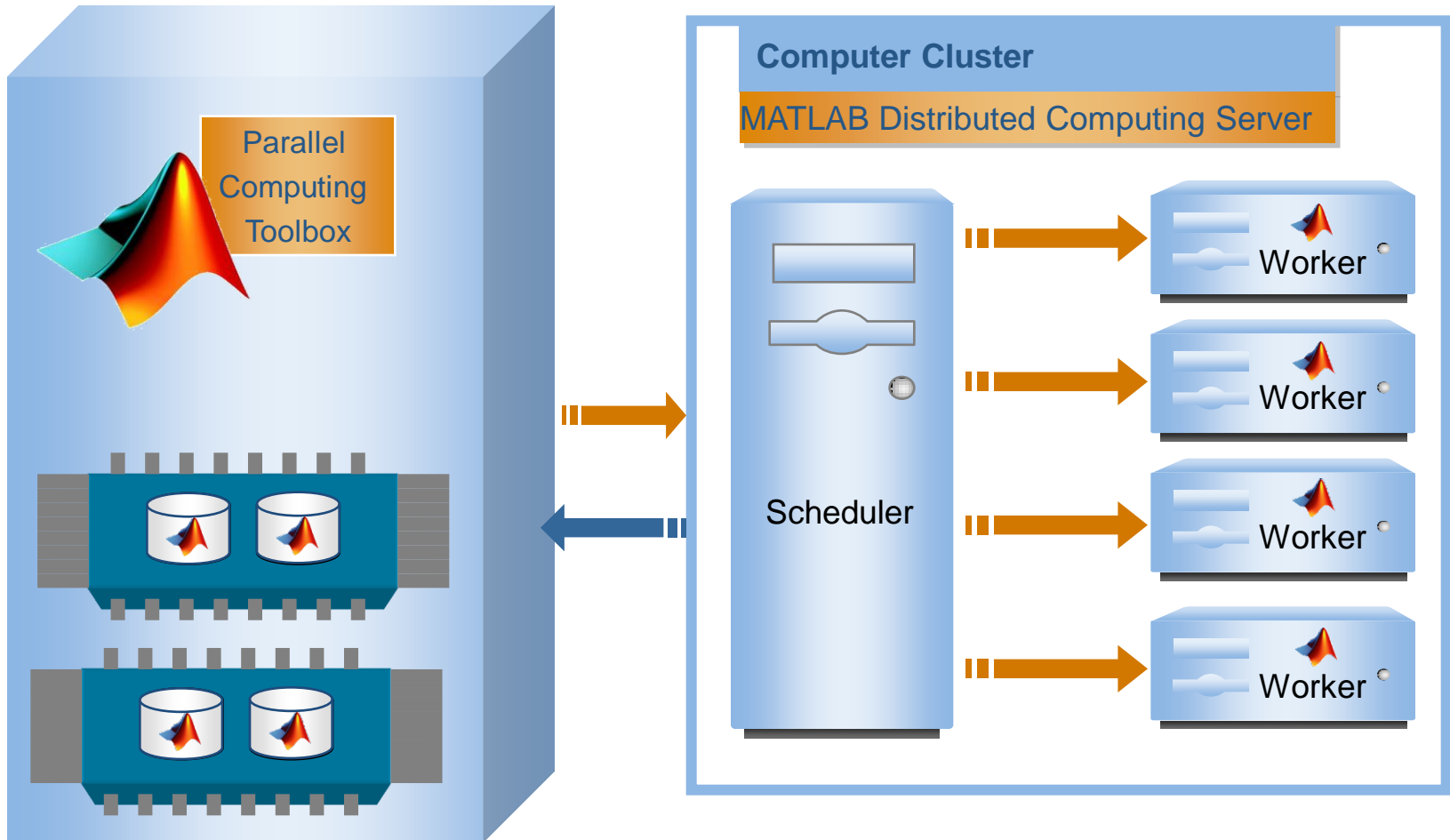
- Don't let graphics be the bottleneck
 - Turn off scopes after you have debugged the model
- Use Simulink Accelerator
 - Additional optimizations are performed during initialization
- Use frame-based processing feature of Signal Processing Blockset
 - Frames are sequences of samples, grouped together for execution
 - Model natural characteristic of many hardware and software systems such as voice coders and modulators
 - Faster simulation versus sample-based signals
- Use distributed computing ("server farm")

Run ~~Four~~ Local Workers with a Parallel Computing Toolbox License



- Easily experiment with explicit parallelism on multicore machines
- Rapidly develop parallel applications on local computer
- Take full advantage of desktop power
- Separate computer cluster not required

Scale Up to Cluster Configuration with No Code Changes



End Results

Communications

- Designed and verified a communications sub-system
- Integrated an antenna pointing model **Mechanical**
- Integrated a video processing unit **Video**
- Integrated a COTS video codec using legacy code tool
 - **Multi-Domain Modeling**
 - **Platform for System Integration**
- Next step: incorporate this model into a broader system simulation that models flight dynamics, target tracking, etc.

Products Used

- Simulink
 - Embedded MATLAB block
- Video and Image Processing Blockset
 - Segmentation, motion estimation, morphology, and more
- Communications Blockset
 - Source coding, error correction, modulation, and more
 - Interfaces to RF blockset for modeling front-end effects
- Signal Processing Blockset
 - Estimation, filtering, linear algebra, statistics, FFT, and more
- SimMechanics
 - Physical Modeling

Thank You for Attending