Developing Communications and ISR Systems Using MATLAB® and Simulink®

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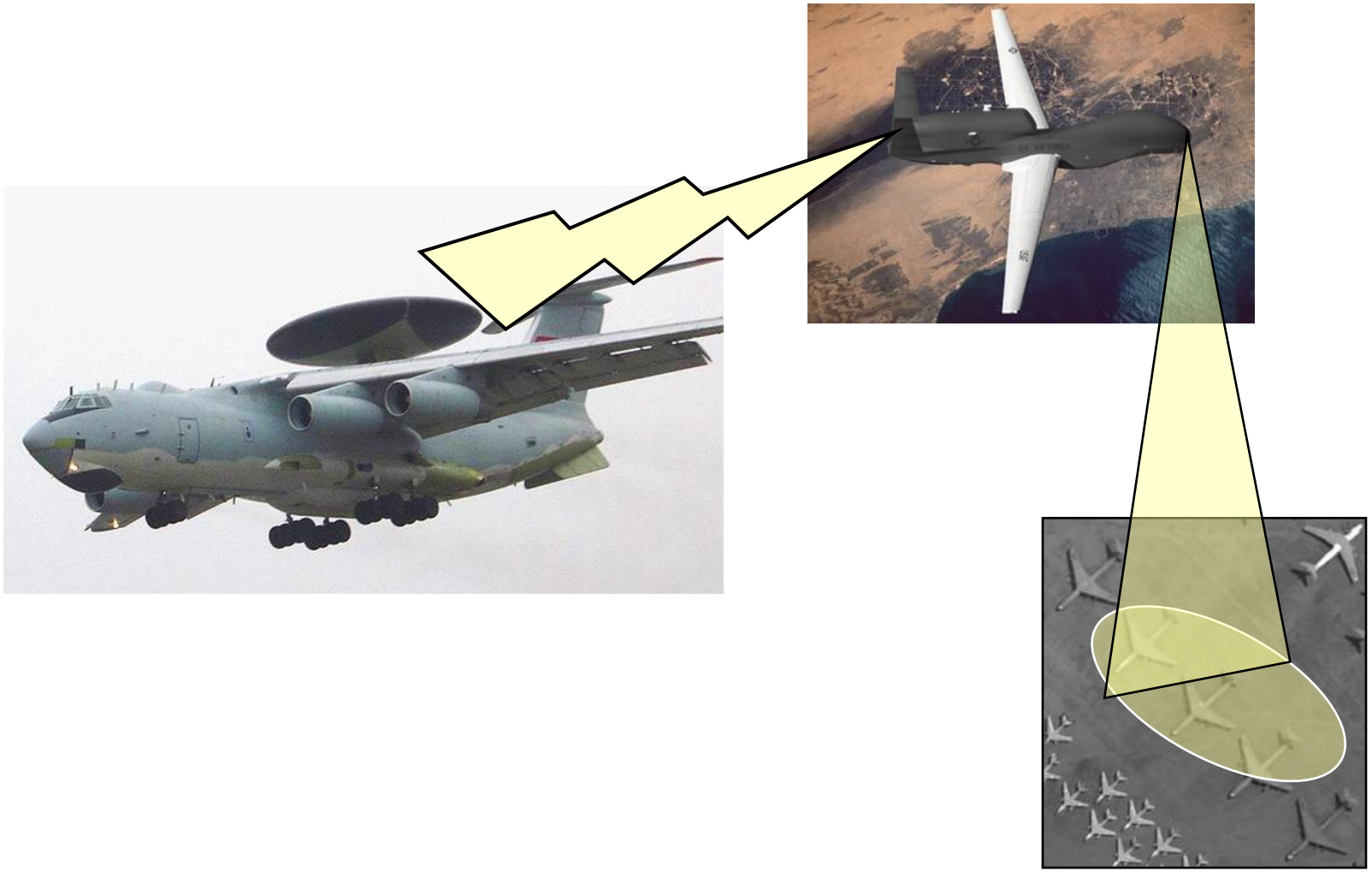
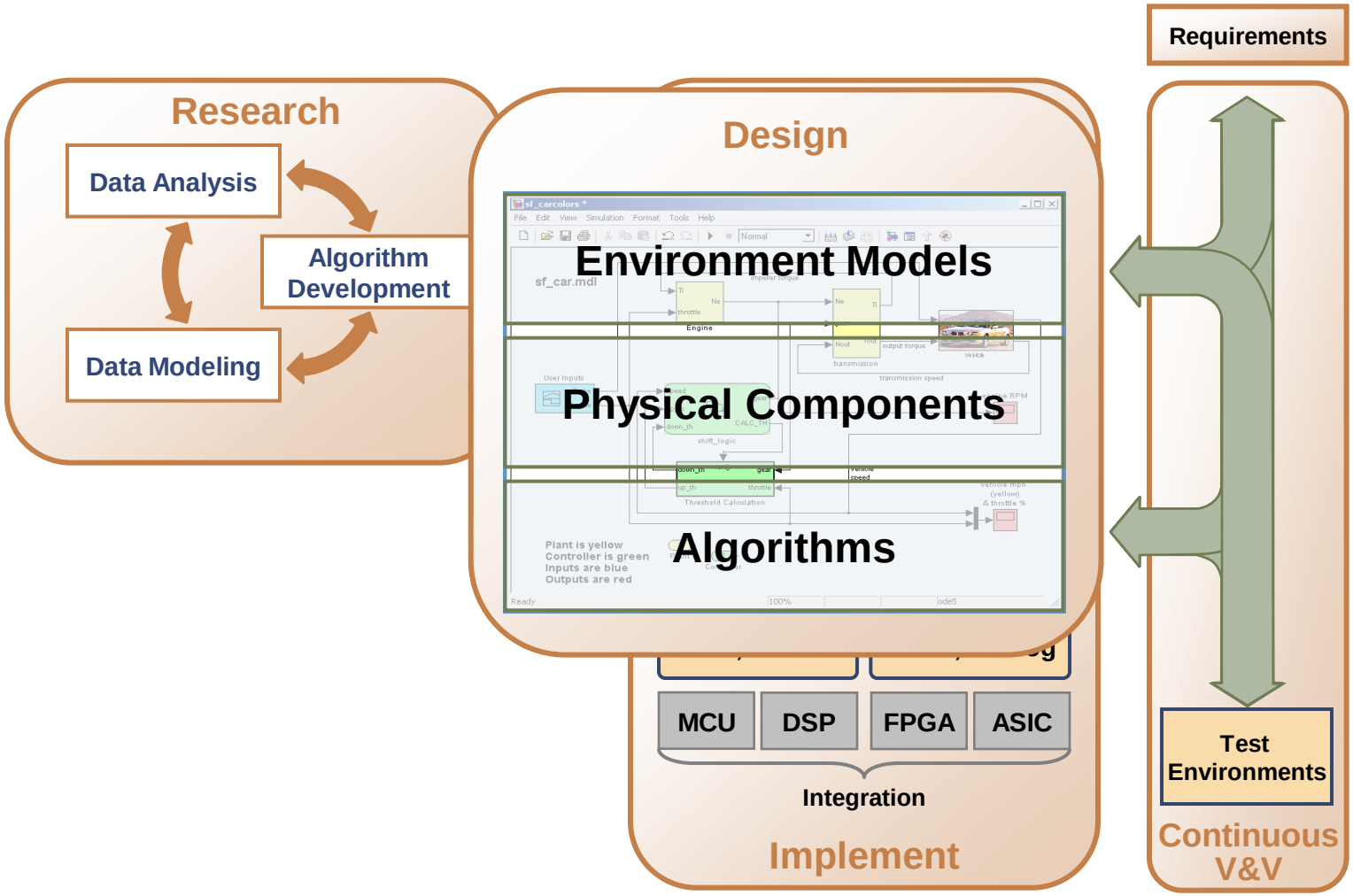
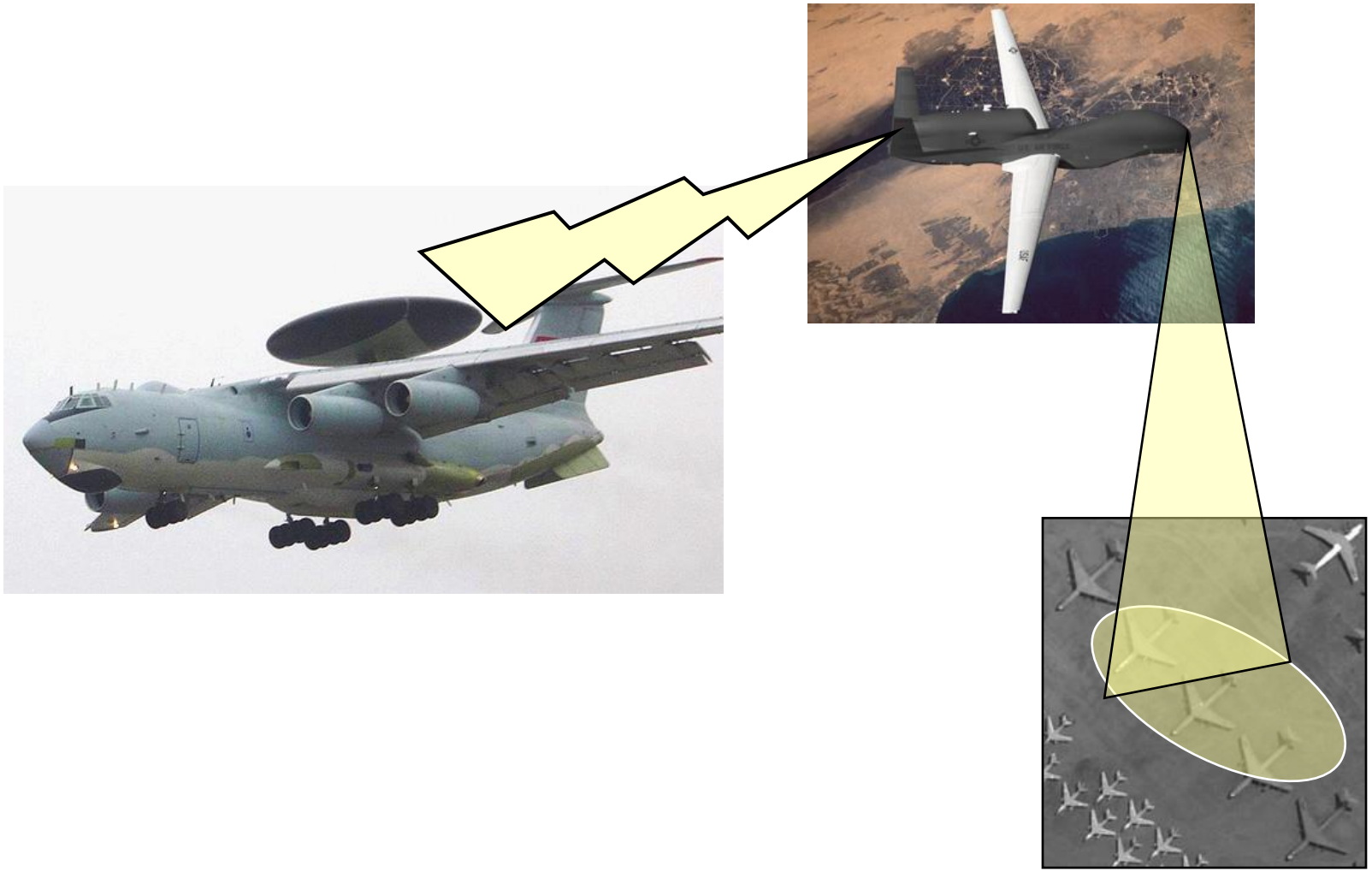
UAV-based Communications and ISR



Model-Based Design Workflow



UAV-based Communications and ISR



Design and Integrate a Video Communications System for a UAV

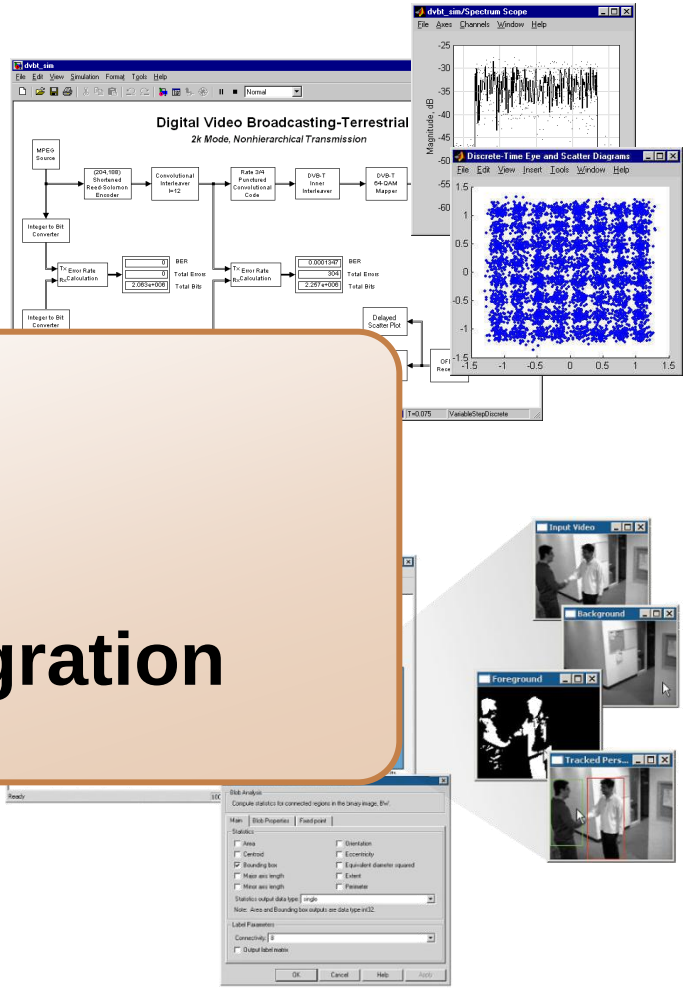
- Design and simulate 3 different system components
  - Antenna pointing control
  - Communications link
  - Video codec and post-processing
- Integrate the components to evaluate overall impact on system performance

Core MathWorks Products

SIMULINK®

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

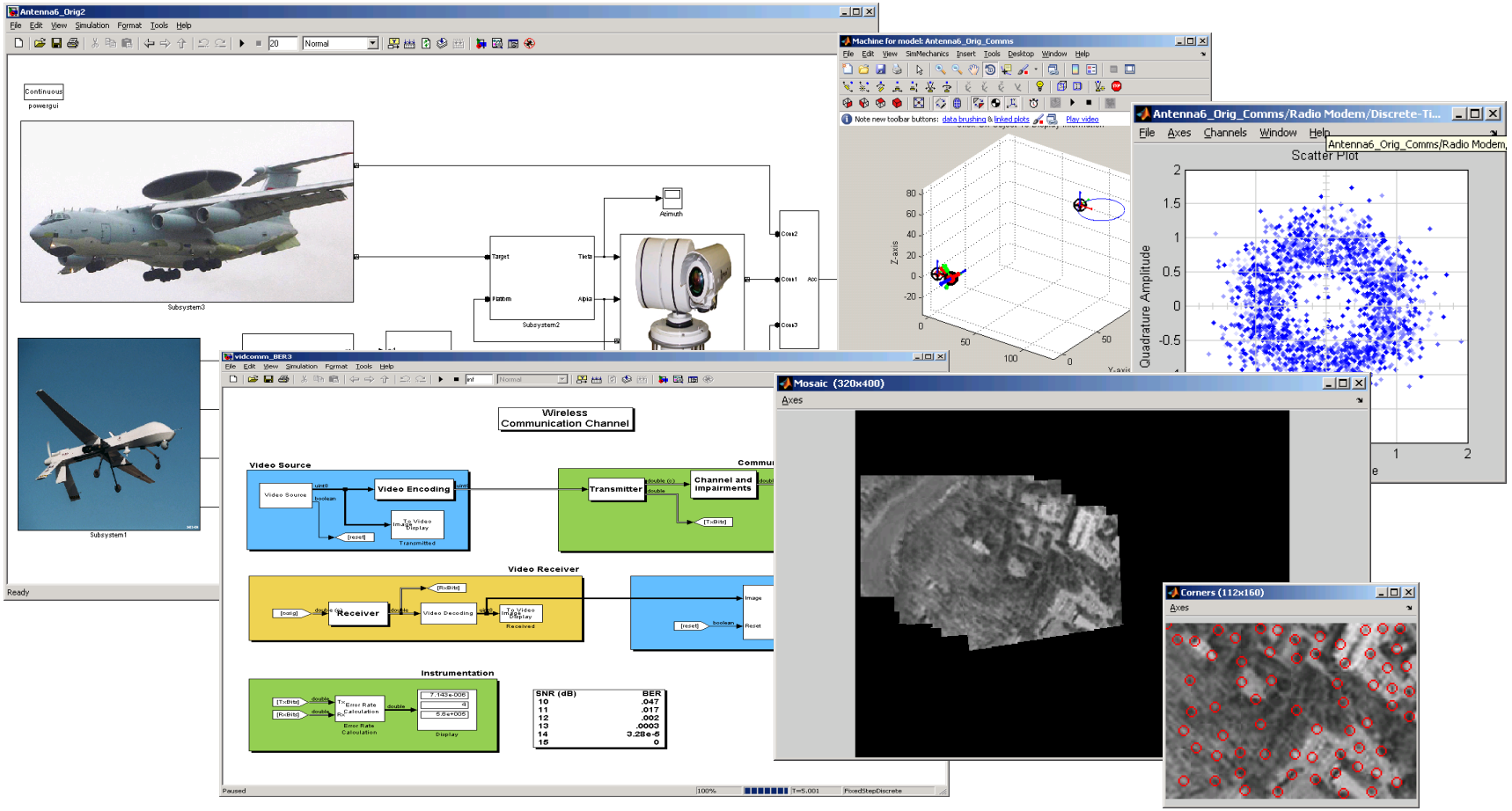
- Foundation for Model-Based Design



- **Multi-Domain Modeling**
- **Platform for System Integration**

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

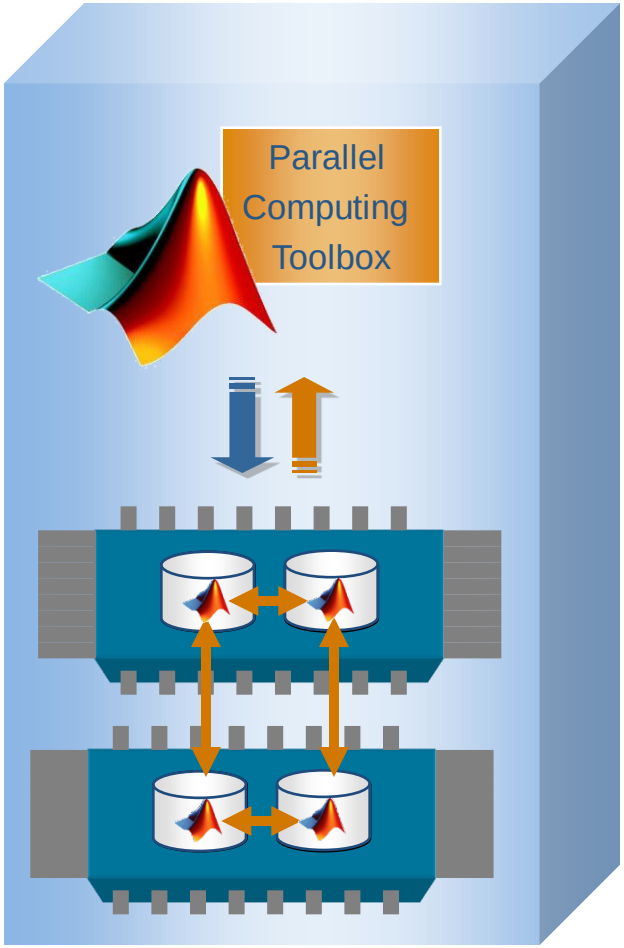
Demonstration



Low Bit Error Rate and Other Intensive Computations

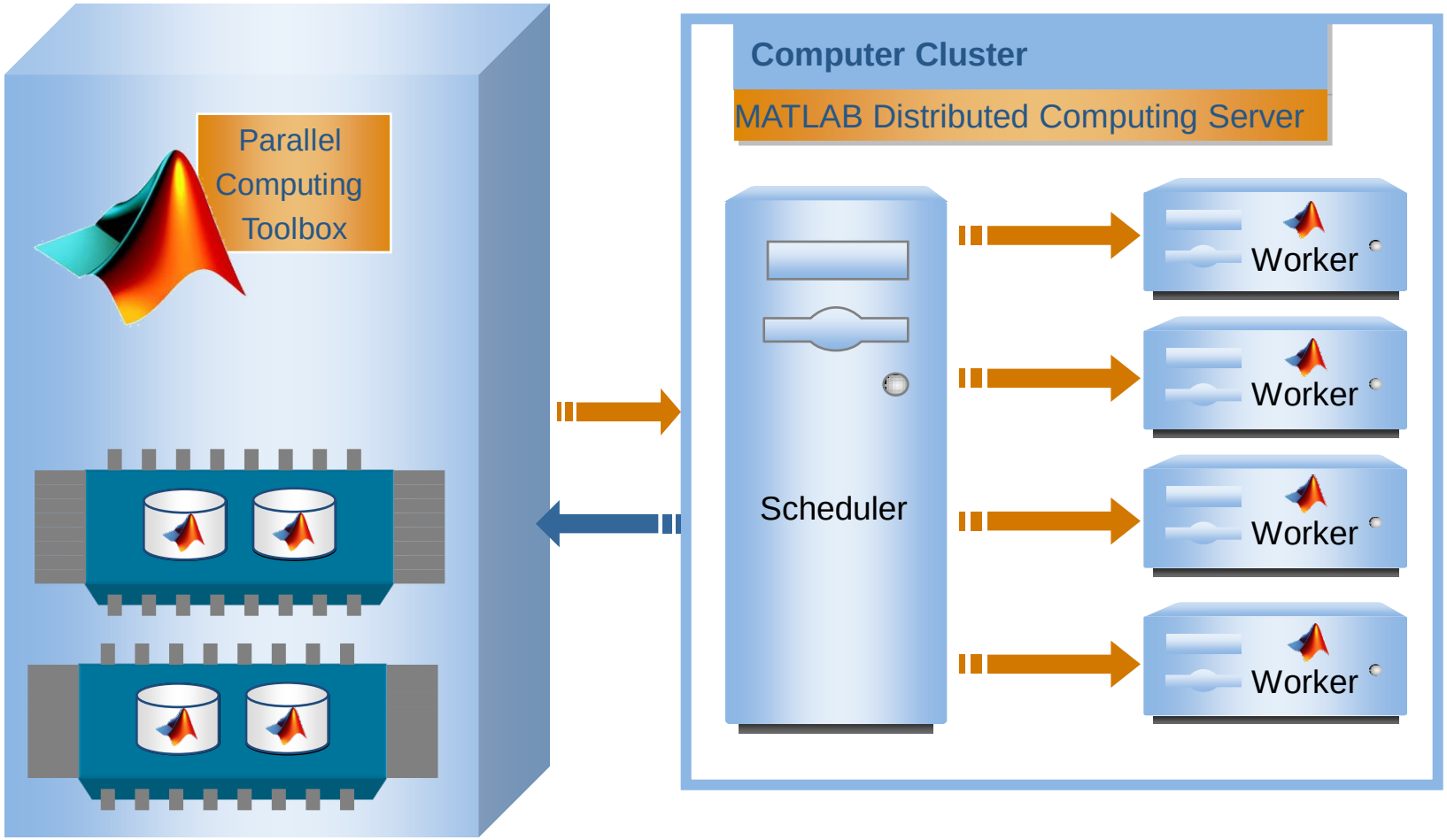
- Don’t let graphics be the bottleneck
  - Turn off scopes after you have debugged the model
- Use Simulink Accelerator
  - Additional optimizations are performed during initialization
- Use frame-based processing feature of Signal Processing Blockset
  - Frames are sequences of samples, grouped together 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 ~~8~~ *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