



Deficiencies in Modeling and Simulation Support for Higher-Level Fusion Research and Development

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The Problem



- Severe gap in modeling and simulation (M&S) technology supporting higher-level fusion R&D.
- Current M&S applications are <u>insufficient</u> for supporting R&D efforts in higher-level* fusion.
 - Data sets generated are inadequate.
 - Hand generating is inefficient.
- Consequence: Software will be developed using data that *fails* to represent the real world.



M&S Technical Goals



- Provide realistic data sets to drive higherlevel fusion software prototypes.
- Generate these data sets in the quantities representative of information overload.
- Develop a set of metrics in M&S to evaluate the performance of higher-level fusion software.



Current Technology Assessment



- Current M&S applications are deficient in the following categories:
 - Entity characteristics and quantities.
 - Ground-truth simulation detail.
 - Sensor models and other models.
 - Software documentation.
 - Interoperability.
- None of the M&S applications investigated either individually or as a set of tools can generate high-fidelity data sets.





- Utilizing physics-based sensor models representative of real world systems.
- Leveraging existing level 1 fusion programs.
- Exploiting situation awareness mechanisms in ground-truth simulators.



- Generating limited data sets of varying levels of fidelity, timeliness, and confidence for fusion software development.
- Documenting and publishing M&S deficiencies.
- Our current efforts are STILL NOT ENOUGH!



Recommendations



• What needs to be done:

- The M&S community must address these deficiencies to <u>ensure robustness and</u> <u>reliability</u> of fusion applications.
- Specifically focused efforts are necessary to generate realistic data sets at fusion levels 1 – 3.
- What doesn't work:
 - Low-budget efforts.
 - Software workarounds.
 - "Garbage in, garbage out" M&S!



Conclusion





Bottom Line: The Warfighter

- Current M&S Technology cannot support higher-level fusion R&D.
- Limited data sets can not stress fusion applications like real-world events.
- If this problem is not resolved then intelligence analysts cannot be confident in the answers provided by fusion software.



Questions?

