Chem-Bio Virtual Prototyping Benefit and Feasibility

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Outline

- Background
- Program overview
- “Virtual Prototyping” Use Cases
- Questions & discussion

ECBC

Purpose

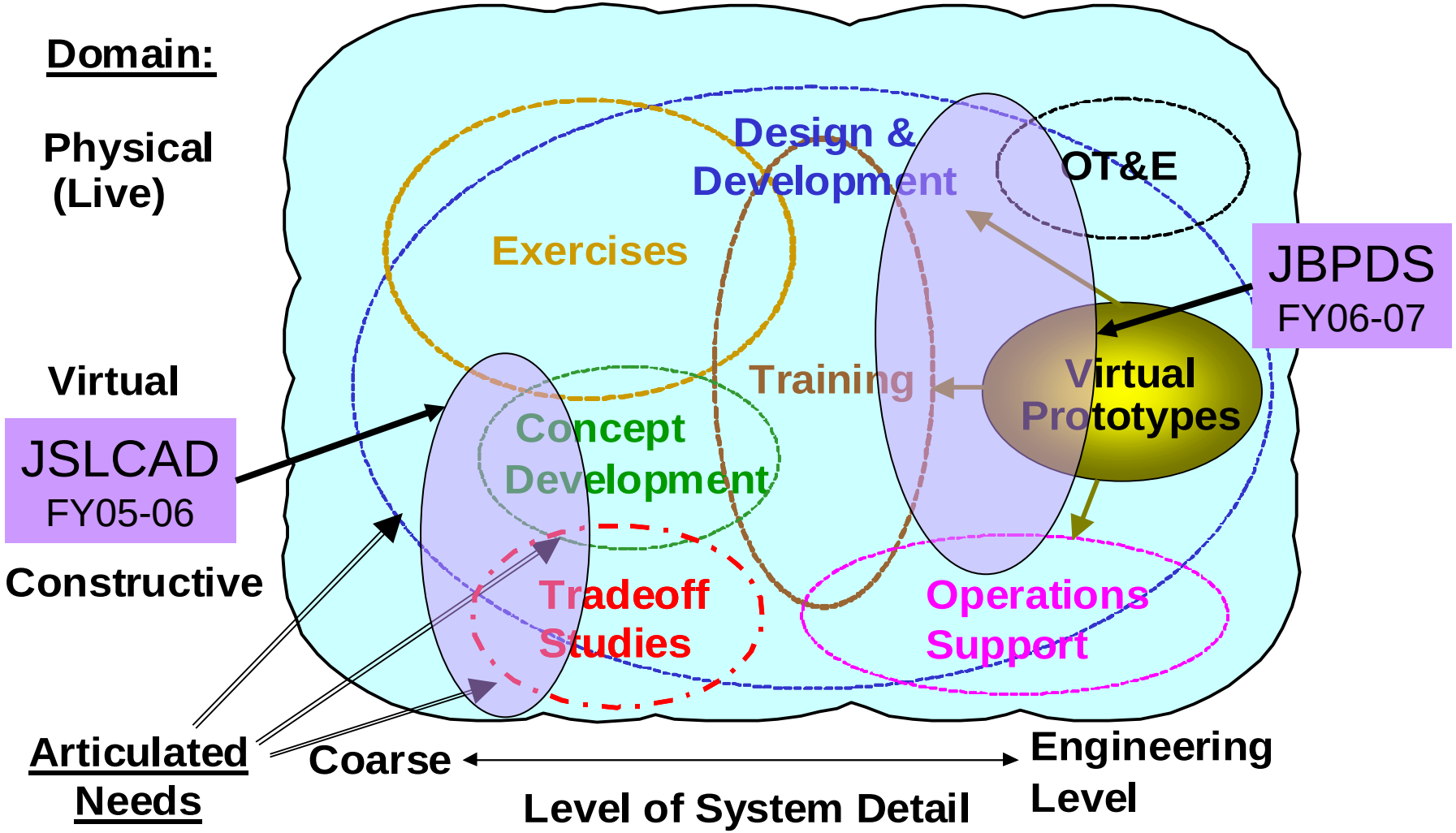
- To document the feasibility of virtual prototyping in support of select CBRN developmental programs and quantify the benefit of virtual prototyping to these developmental programs. Will provide lessons learned for application by other JPMs and identify virtual prototyping technology gaps that the JSTO program may desire to support.

"In the beginning...."

- Ancient history: The term "Virtual Prototyping System" harkens back to the days of Business Area Manager (BAM) Dave Grenier who had a vision to establish a one-stop shopping repository or environment of virtual prototyping tools that any JPM could walk up to and with some keystrokes ask it to help him/her design widget XXXX and, oh by the way, characterize its performance over a range of operating conditions. This initial attempt was met with everything from mild skepticism to utter hatred.

- DTRA CAPO requested analysis to answer issues raised in IDA Report, *Virtual Prototyping for the Chemical/Biological Defense Program*, October 2004

Domain for Use Cases



Functional Performance VP Use Case JSLCAD

- PM addressed the issue of elevation angle extents for system field of regard
- Needed to consider impact of terrain, attack type, vehicle route, etc.
- Tradeoff between large FOR to avoid missing an attack and smaller FOR to increase probability of detecting attack given it is within the FOR
- Using a variant of CB Dial-A-Sensor™ (CB DAS) called CB Analyzer which operates in non real-time mode

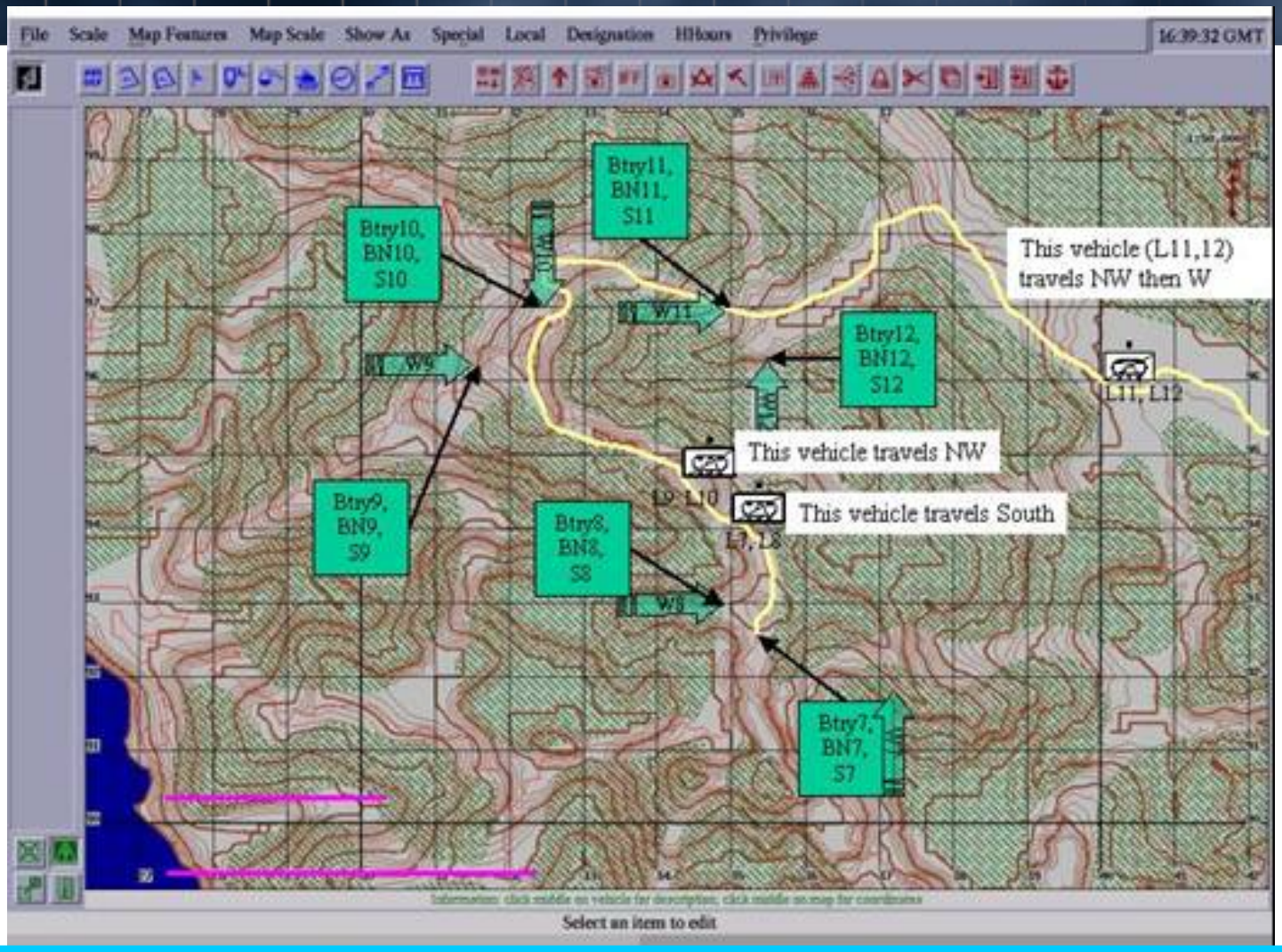
"Virtual Prototyping" Use case for System Performance Requirements

Operational Vignette
Moderate Elevation Terrain

All vehicles travel from SE to NW along recon route

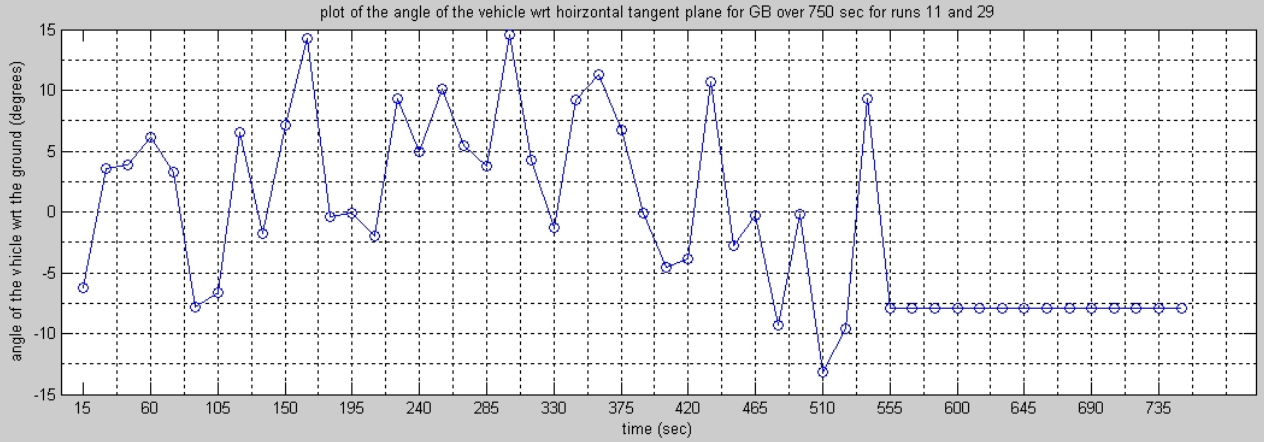
Extend system evaluation to conditions not currently tested

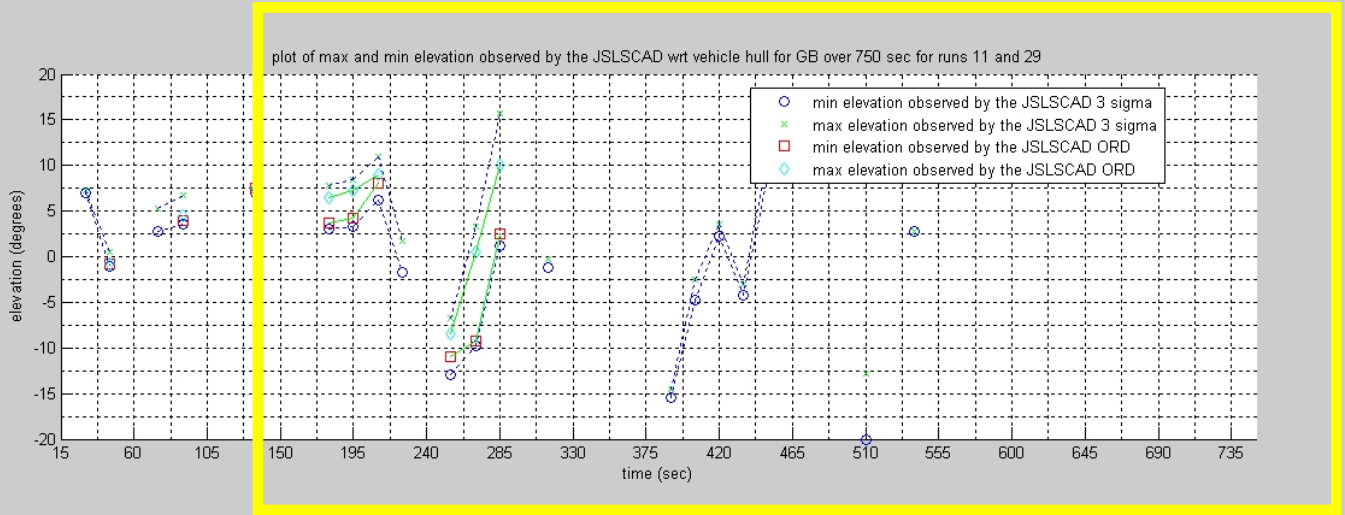
Operational Vignette
Mountainous Elevation Terrain



Extend system evaluation to conditions not currently tested

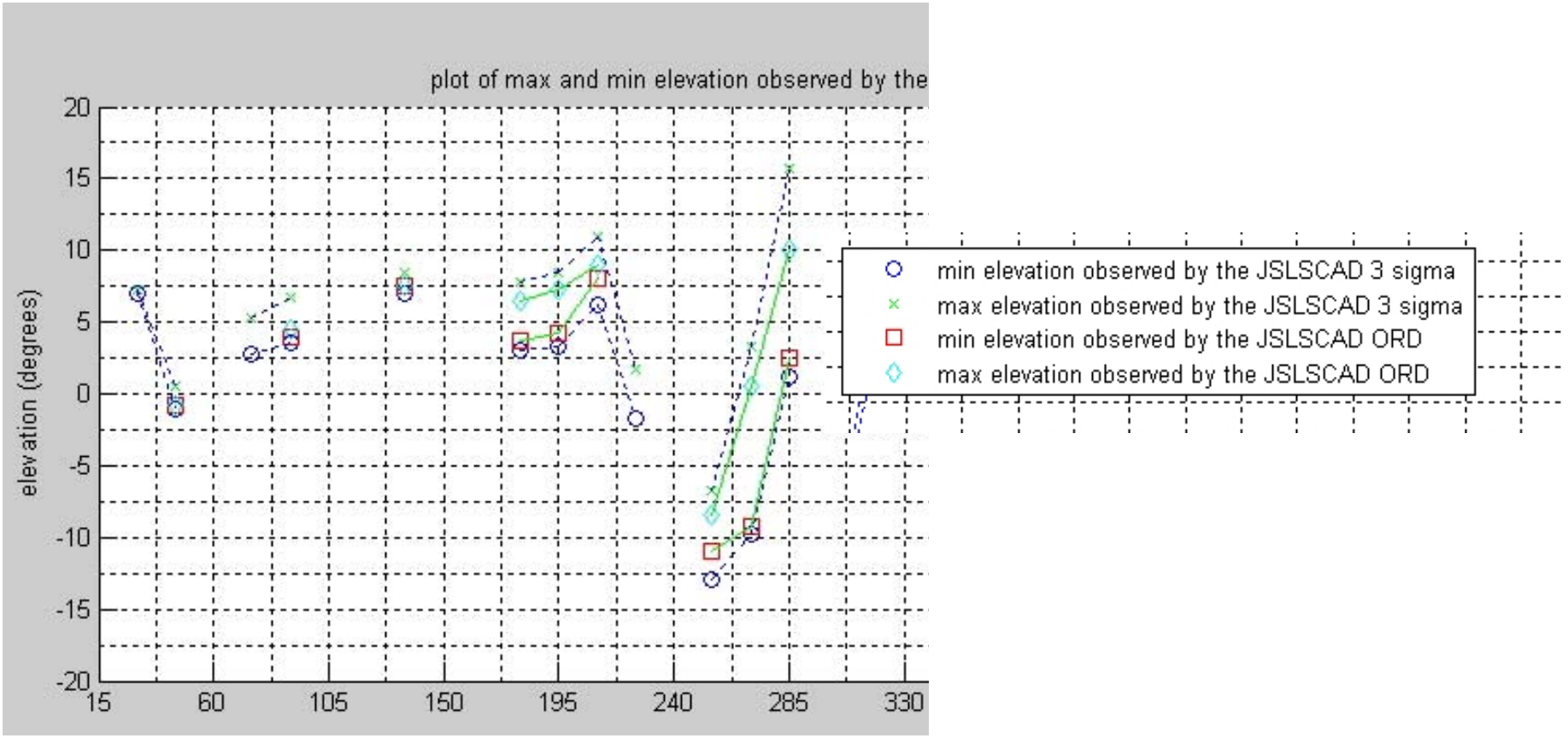
Use Case Example Results
(L5, W5, BN5)





M&S Captures the Decidedly Dynamic Situation

Use Case Example Results
(L5, W5, BN5)



Windows of visibility

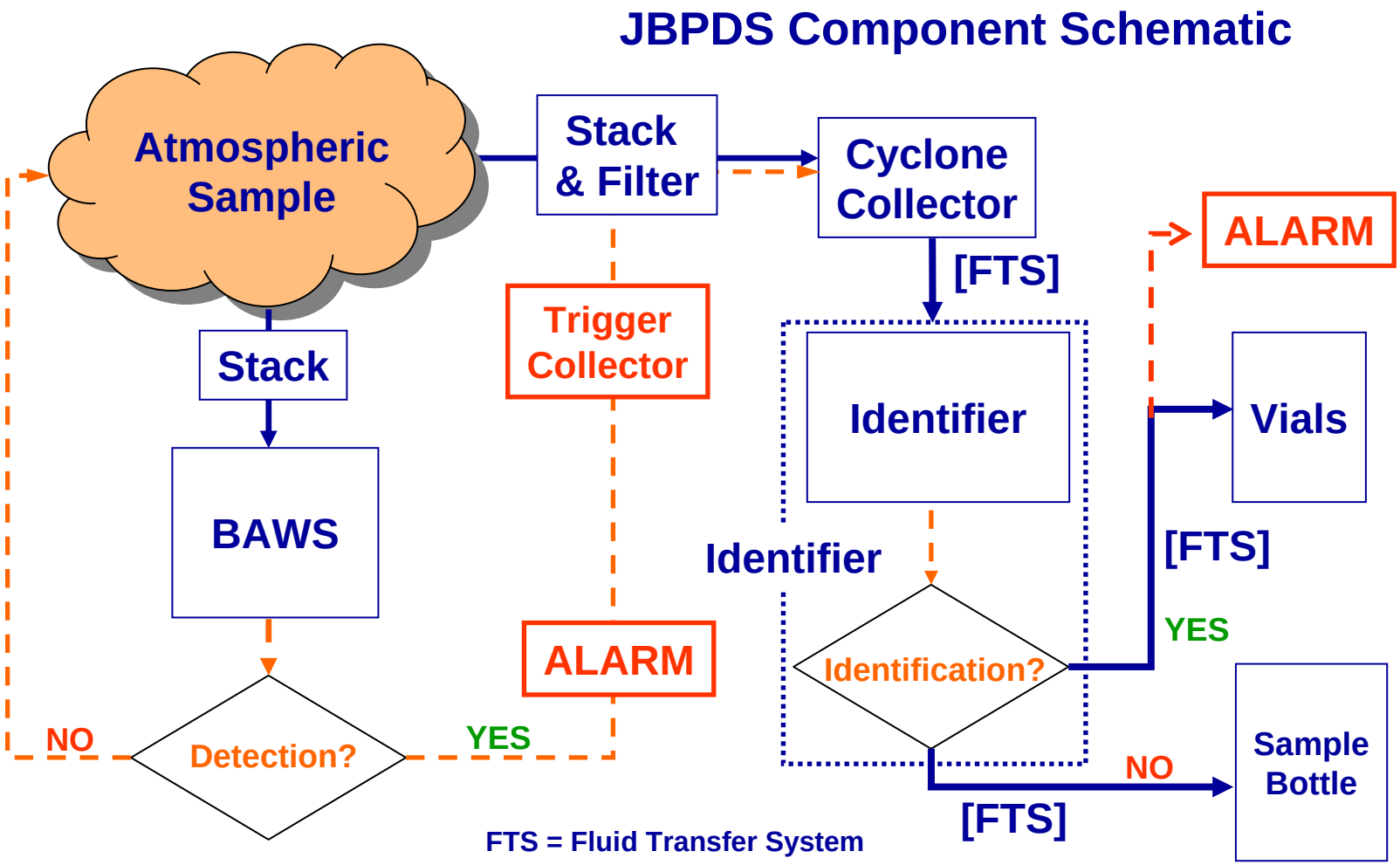
Functional Performance VP Use Case JSLCAD

- The data from 288 simulation runs has been analyzed and the PM is considering next course of action.

- Same tools are also being used by Army Evaluation Center (AEC) and Dugway Proving Ground (DPG) to evaluate the effect of a reduced field of regard in both elevation and azimuth.

Others perceive this technique and these tools as useful

JBPDS System Modeling



True(er) Virtual Prototype In development for JBPDS System

JBPDS Modeling Goals

Support JBPDS Whole System Live Agent Test (WSLAT)

- Verification: “strung out” vs “as built”
- Extend test capabilities
- This effort was a recommendation of National Research Council (NRC) report

Establish a VV&Aed engineering level model to support future activities

- Operation in disparate environments
- Effects of system modifications

This demonstration will quantify how well they did

WSLAT V&V

- The modeling effort for WSLAT is wholly JPM funded. JSTO funds have been applied to the experimental design process for their V&V
  - MSA Team, has provided experimental design support for most aspects of the chamber and field testing.
- The WSLAT team has involved the test and evaluation community from the get go
- This will be a good test of how far the VV&A process can be pushed to allow M&S to focus/extend/supplant traditional testing

PM Perceptions

- Using VP to clarify/refine performance requirements translates to cost savings due to avoiding redesign
- PMs see need as they are funding on their own; however…
- A common VPS or toolbox *could* lead to better reuse of code and the ability to apply virtual prototyping earlier in the development process
  - Issue may be as much cultural and programmatic as opposed to technical
  - However, recent developments within JPOE CBD are revitalizing idea of common (possibly reusable) M&S and analytical techniques across the JPMs
- Final quantification of benefit depends on:
  - Ability to perform and document VV&A
  - Acceptance by T&E community: if M&S does nothing to reduce or focus testing, what doth the PM gaineth?
  - Success or failure of PM to get performance requirements modified based on M&S results

Benefit Quantification Ongoing

VPS report schedule

- Both use cases documented with additional findings in FY07 final report
- Mar 07: Draft for review by TAM and others at her direction. Will include all JSLCAD outcomes and lessons learned. For JBPDS this version will likely not have much on the V&V since full scale testing will still be ongoing.
- Apr-May 07: Receive input and revise report
- Jun 07: Final report published