Test Technology Division

West Desert Test Center,

U.S. Army Dugway Proving Ground

GENERAL DYNAMICS
Information Technology

A New M&S Tool to Supplant Decontamination Testing: The Decontamination Efficacy Prediction Model (DEPM)

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Briefing Outline

- History/Background
- Model Structure
  - Key Object Classes
  - Key Objects
- Agent Flow Diagrams
  - Contamination & Aging Phase
  - Decon Phase
  - Residual Hazard Phase
- Questions?

History/Background

Historical Background

- Initiated in 2003 as the Equipment Contamination Survivability Tool (ECS), funded by the VPG Program
- Initial phase was survey of existing models and databases
- In 2005 Anteon Corp. was selected to begin model design
- Proof-of-principle prototype demo'ed in Sep. 2005 at DPG
- With VPG termination in 2006, project is now funded by DTRA, with ECBC performing live agent testing
- Modeling effort now focused on simulating coupon testing of various materials in a chamber environment
- Model renamed to Decon Efficacy Prediction Model to reflect new focus; Anteon now part of GDIT

What is the Decontamination Efficacy Prediction Model (DEPM)?

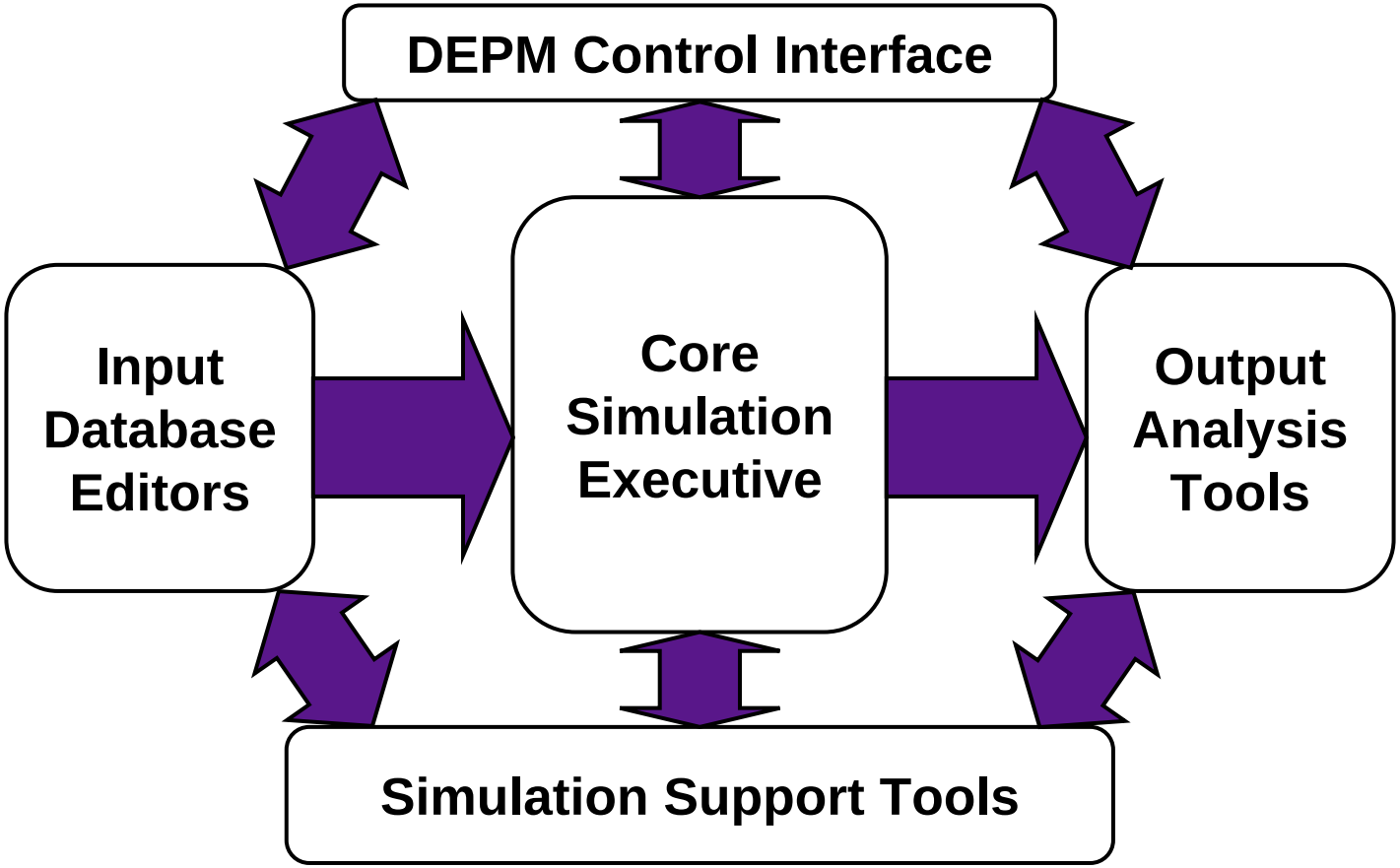
- The DEPM is a software tool that will simulate the contamination/aging/decontamination of material items
- Usable model prototype to be ready early 2007
- Provides a “Virtual Chamber” to subject simulated items to the four key phases:
  - Contamination
  - Aging
  - Decontamination
  - Residual Hazard

Potential Benefits of the DEPM

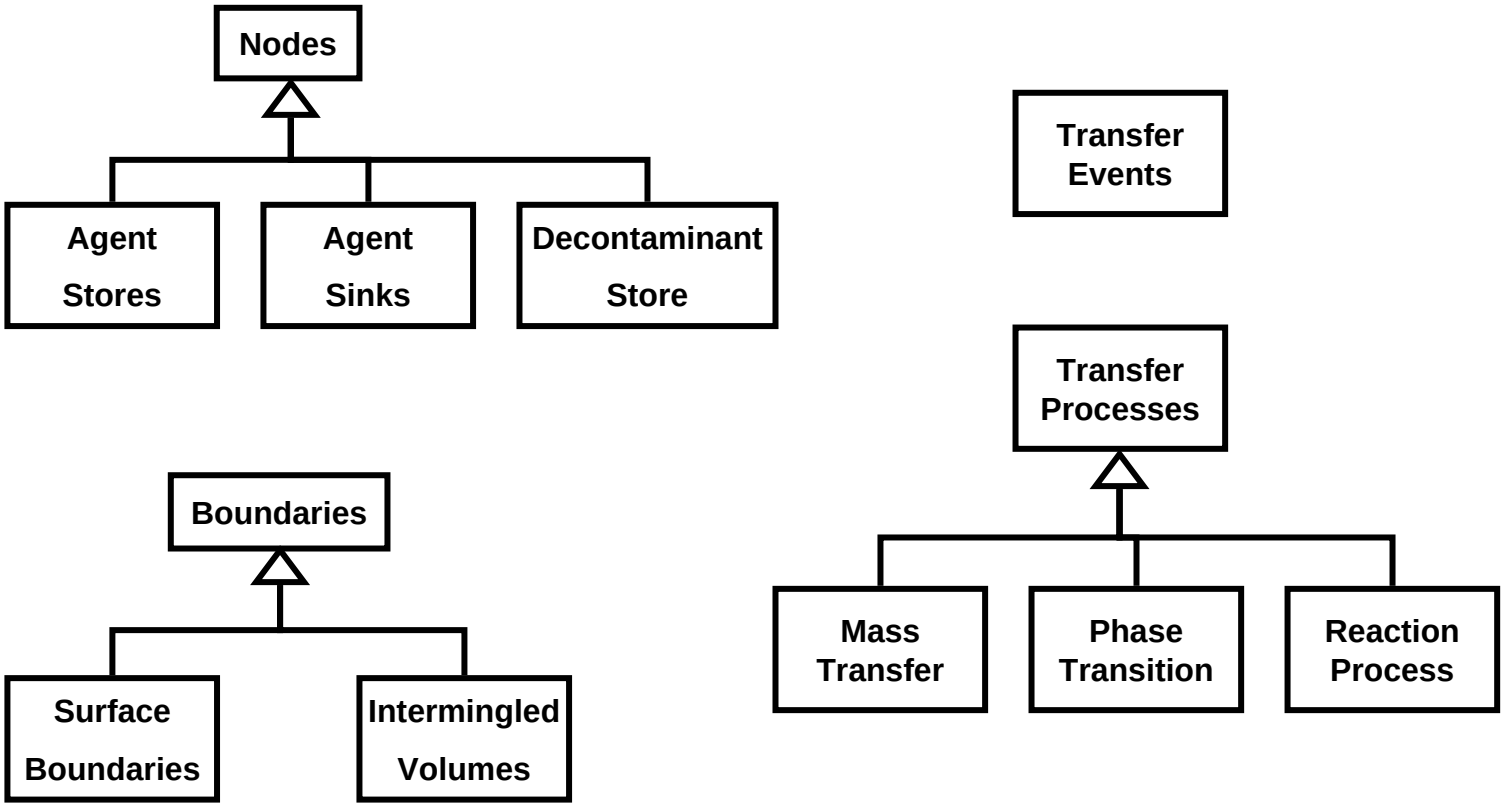
- Not meant to replace all laboratory tests – will complement
- Allows paring down of live testing case matrices
- Allows a wider spectrum of contamination and environmental conditions to be explored
- Provides a platform to test complex items or collections of items – testing not generally possible in chambers with live agent

Model Structure

DEPM Model Structure

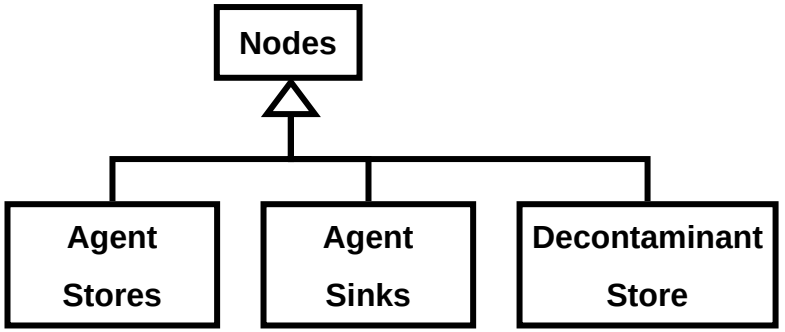


Key Object Classes (Generalized)



Stores and Sinks Object Classes

- **Objects of these classes "contain" quantity of agent or decontaminant**
- **Mass can transfer into or out of Stores**
- **Mass can only transfer into Sinks**
- **A store is assumed to be of homogenous material**



- **Key Object Attributes:**
  - **Current Mass (**units: *mass*)
  - **Rate of Change (**units: *mass/unit time*)

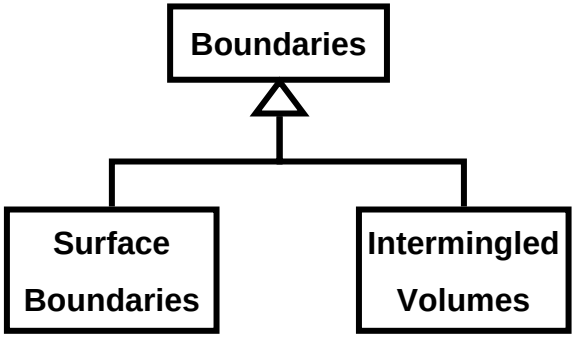
Transfer Event Object Classes

- **Transfer Events Objects are used to represent the transfer of agent mass into or out of a store/sink that is assumed to occur at a discrete point in time (rather then over a period of time)**

- **Key Object Attributes:**
  - **Varies by Specific Object**
  - **Typically: mass, percent/fraction transferred, etc.**

Boundary Object Classes

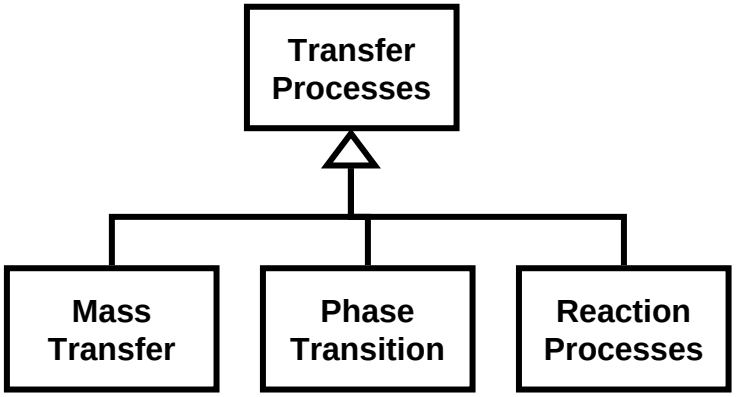
- **Boundary Objects represent the "boundary" between agent stores/sinks**
- **These objects work with Transfer Process Objects to represent the flow of agent from store to store/sink**
- **"Intermingled Volumes" are used to represent the boundary between agent/ decontaminant stores that occupy the same "space" – typically used with reaction processes**



- **Key Surface Object Attributes:**
  - **Surface Area (**units: *area***)**
- **Key Volume Object Attributes:**
  - **Volume (**units: *volume***)**

Transfer Object Classes

- **Transfer Objects work with Boundary Objects to represent the transfer/ transformation of agent mass between stores and sinks**



Agent Flow Diagrams

Agent Flow Diagrams

- The following slides show the general flow of agent mass from store to store/sink via boundaries using various transfer processes

Agent

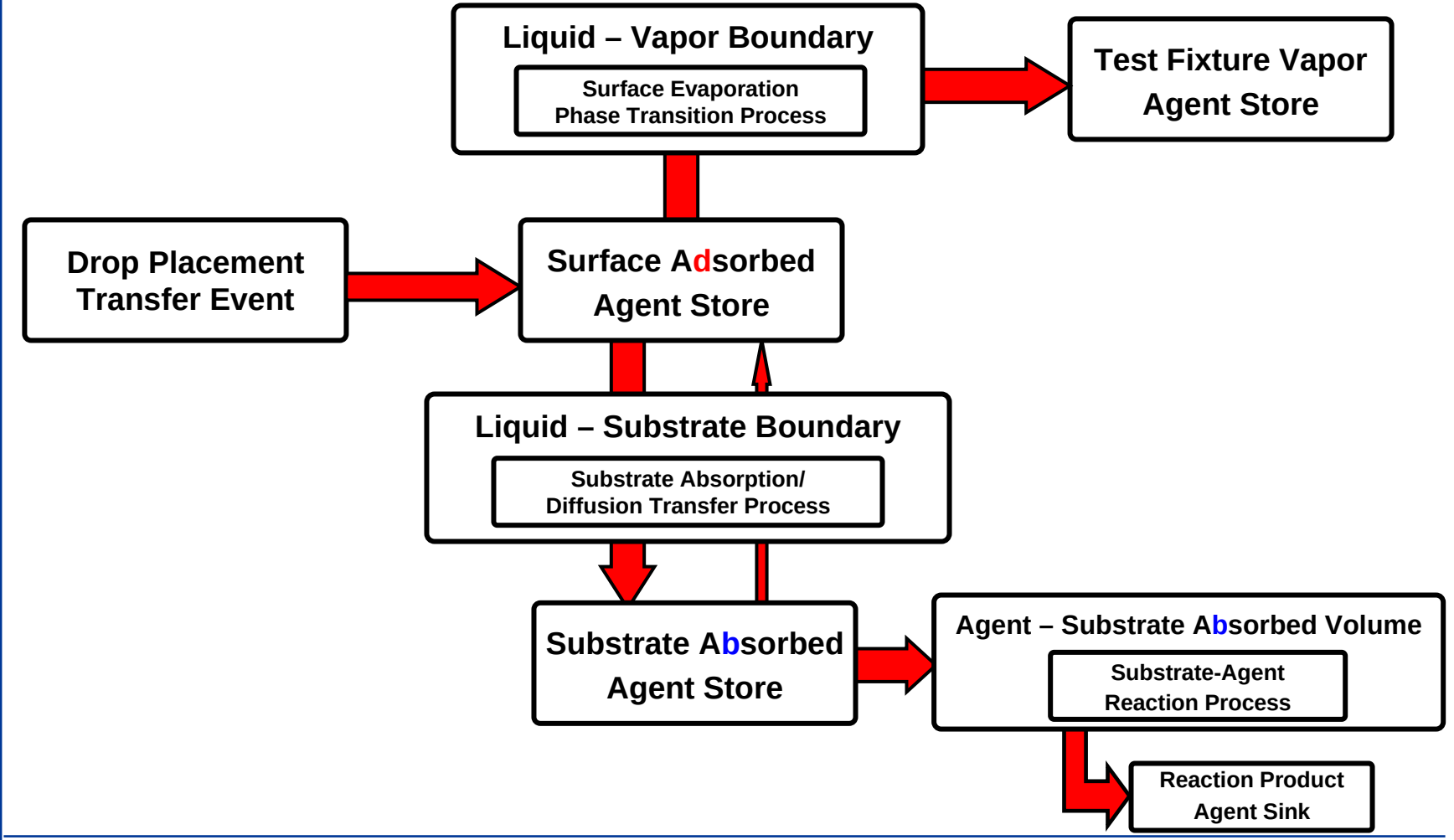
Decontaminant

Reaction Product

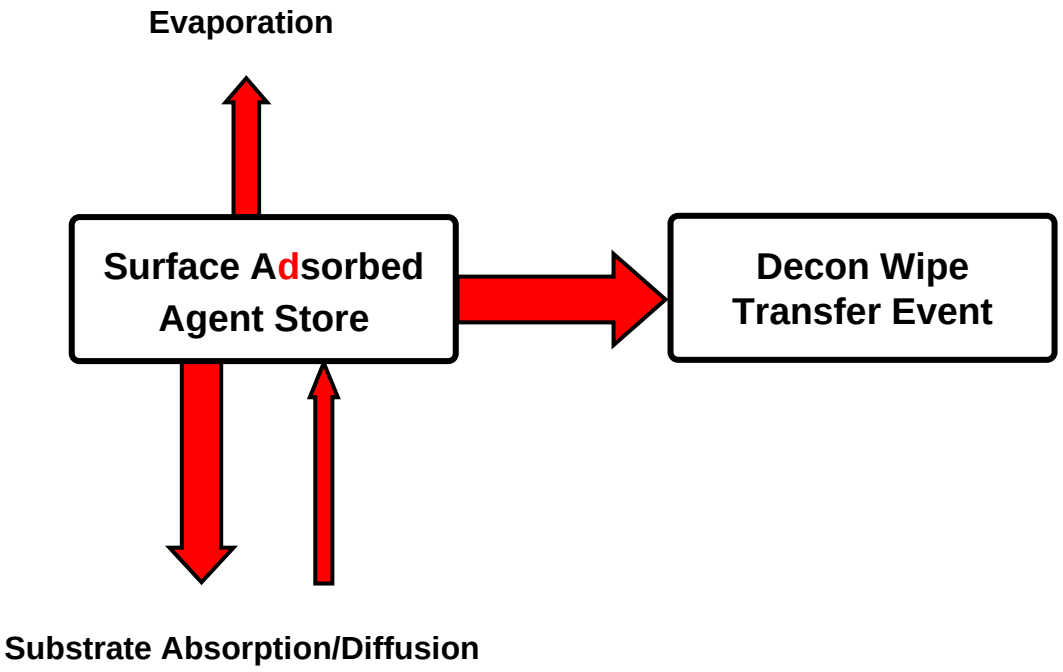
Phases Represented in Simulation

- Contamination & Aging
- Decontamination
  - Physical Removal
  - Vapor – Vapor Decon
  - Surface Decon
  - Substrate Penetration Decon
- Residual Hazard
  - Residual Evaporation
  - Contact Hazard

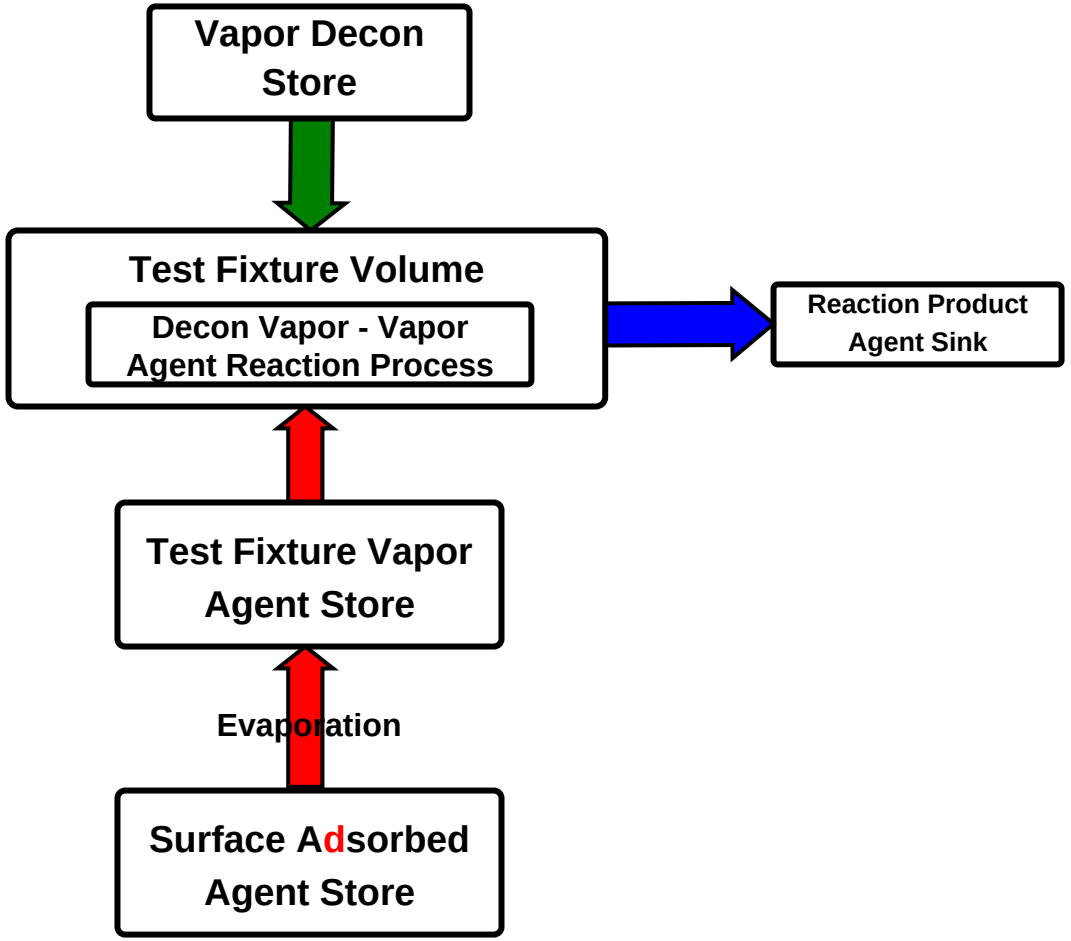
Agent Flow: Contamination & Aging Phase



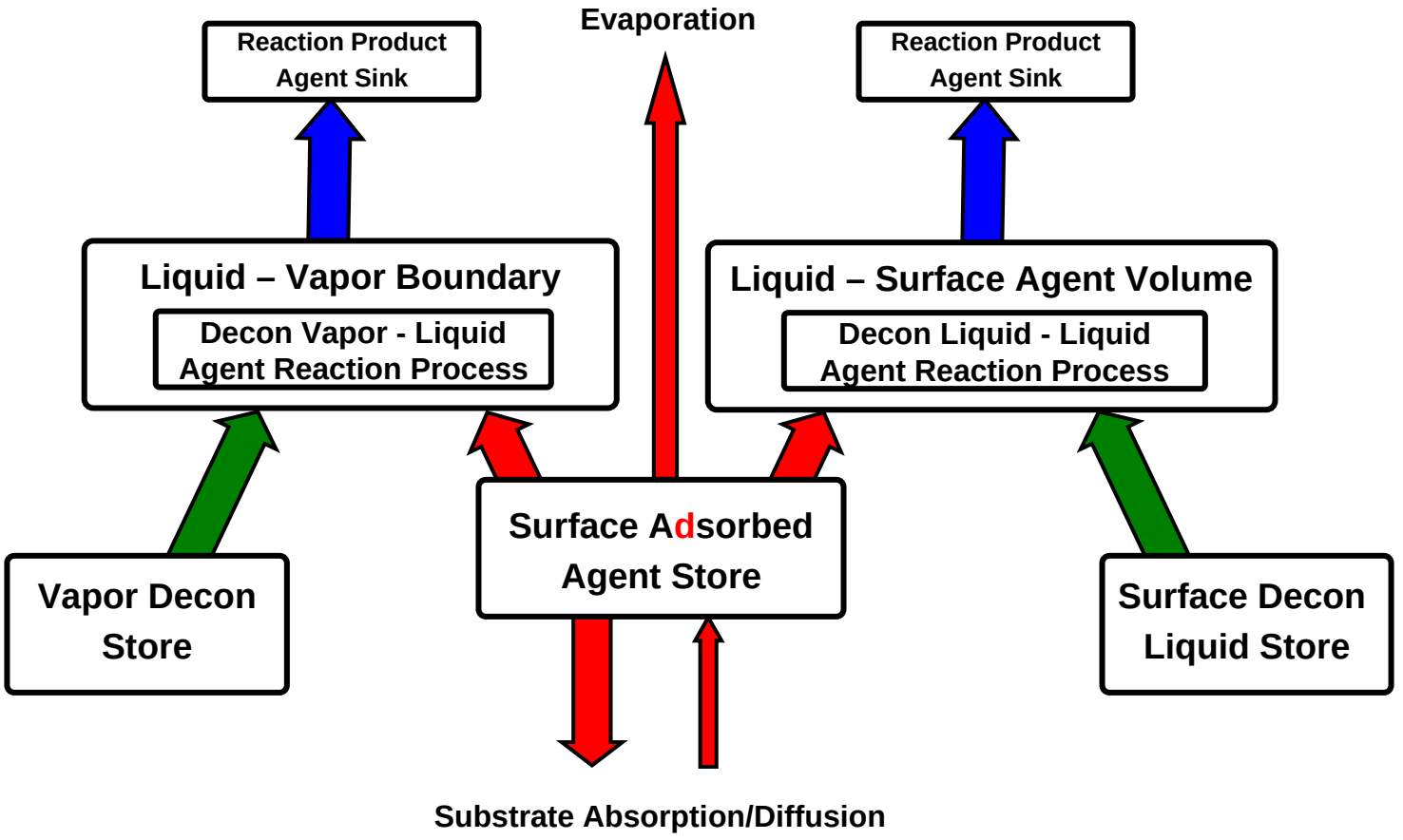
Agent Flow: Decontamination Phase (Physical Removal)



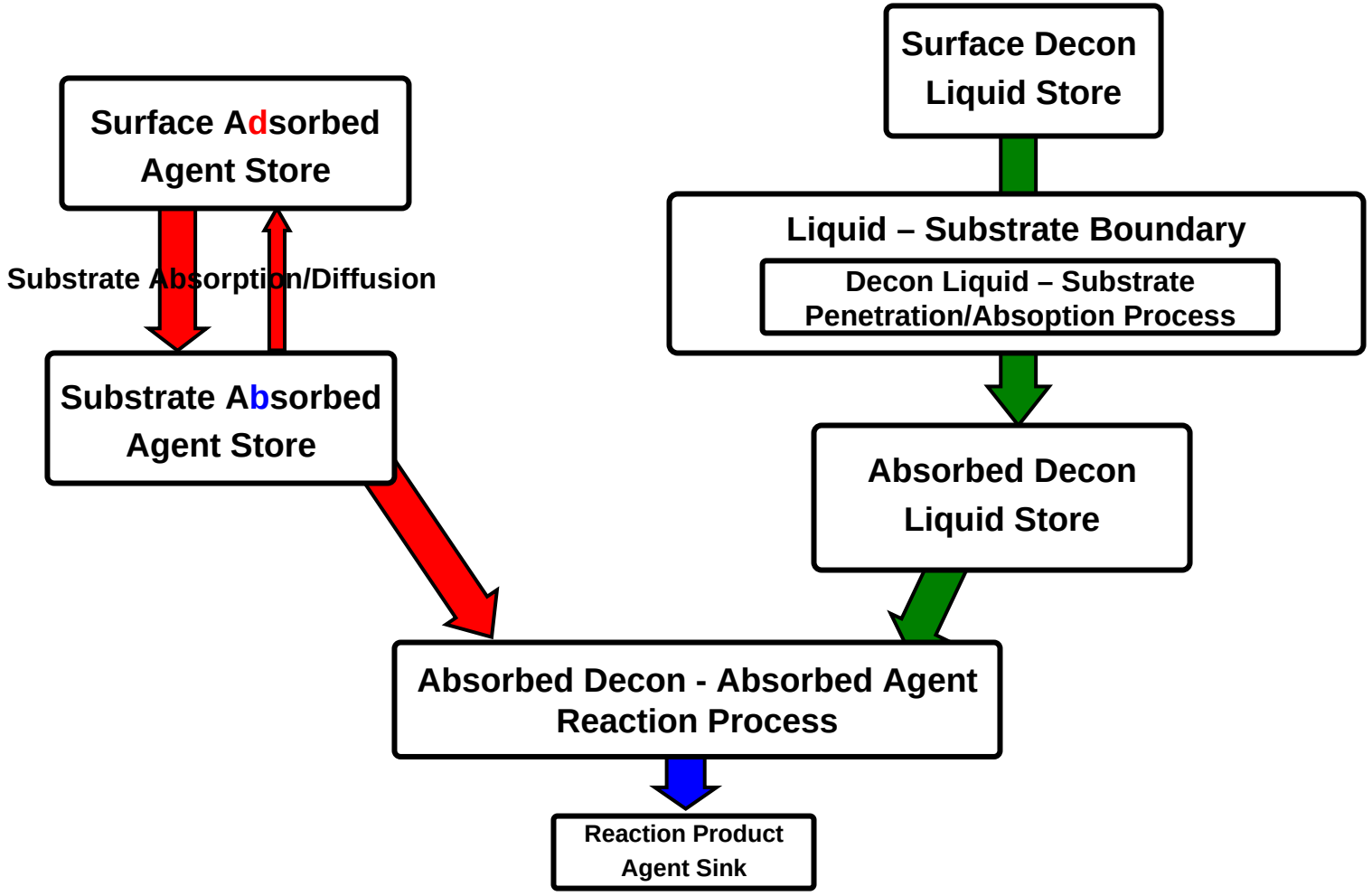
Agent Flow: Decontamination Phase (Vapor - Vapor Decon)



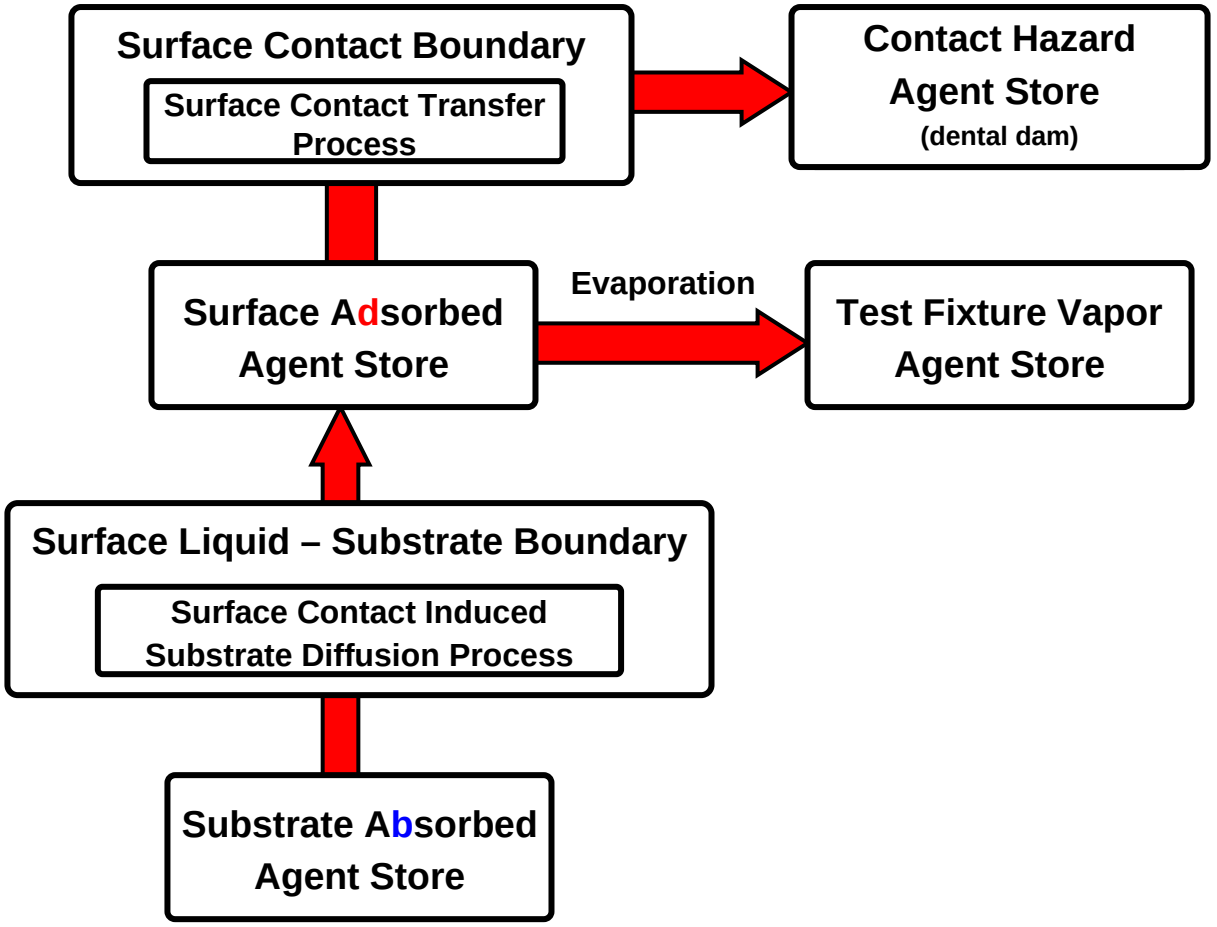
Agent Flow: Decontamination Phase (Surface Decon)



Agent Flow: Decontamination Phase (Substrate Penetration Decon)



Agent Flow: Residual Hazard Phase



In Summary

- Proof-of-Principle Prototype (as the ECS Model) has been completed and demonstrated at end of FY05
- Current development effort is projected to reach limited decontamination efficacy prediction capability by early CY07
- Incorporation of more detailed and advanced functionality will continue in FY07 to allow for more realistic simulations of live agent coupon contamination, aging, and decontamination, the level of effort commensurate with funding

Questions?