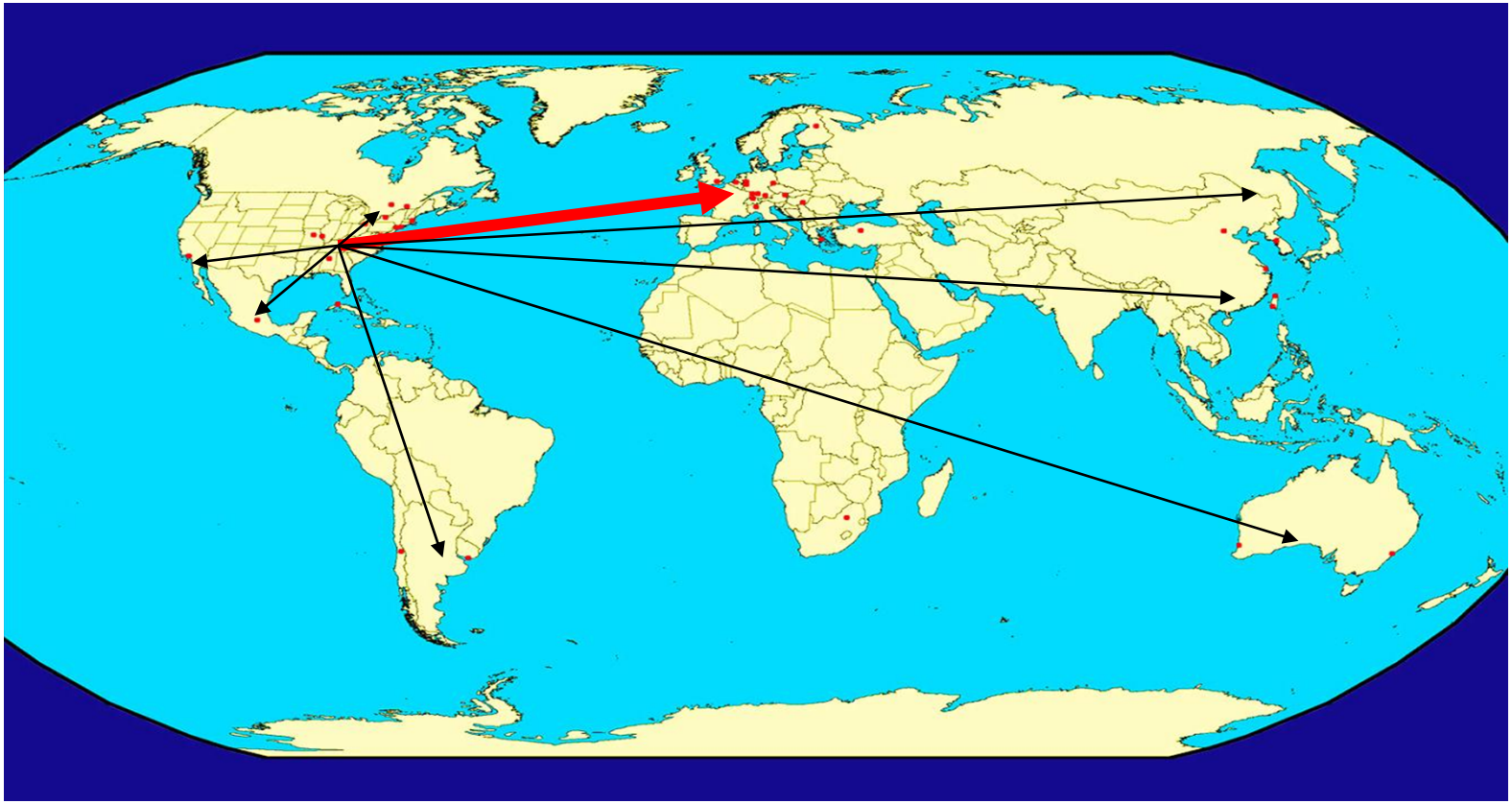
Tracking Radioactive Material Shipments using RFID and Web 2.0



April 7, 2011

Presented by:
Randy Walker
Oak Ridge National Laboratory

For: Joint Radioisotopes Subcouncil Meeting

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U.S. Radiation Source Security Background

60 high-risk sources were lost or stolen between 1994 and 2005, with an average of one per year not recovered

Between 1999 and 2005, the Department of Energy recovered 12,024 sources that were considered vulnerable or at a high-risk for theft or misuse

An average of about 300 sources

of all types

are reported lost or stolen each year

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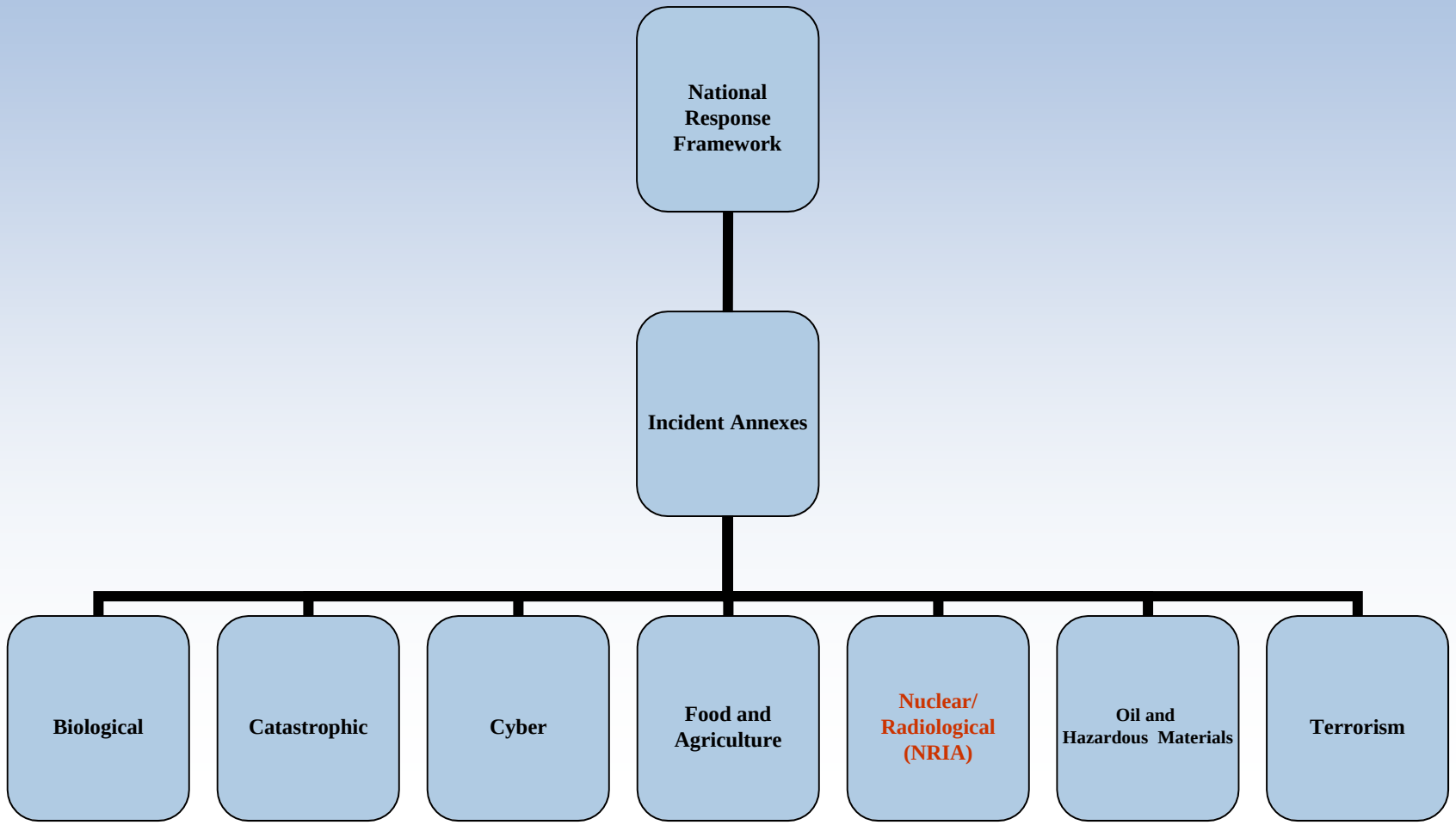
Nuclear/Radiological Incident Annex Framework



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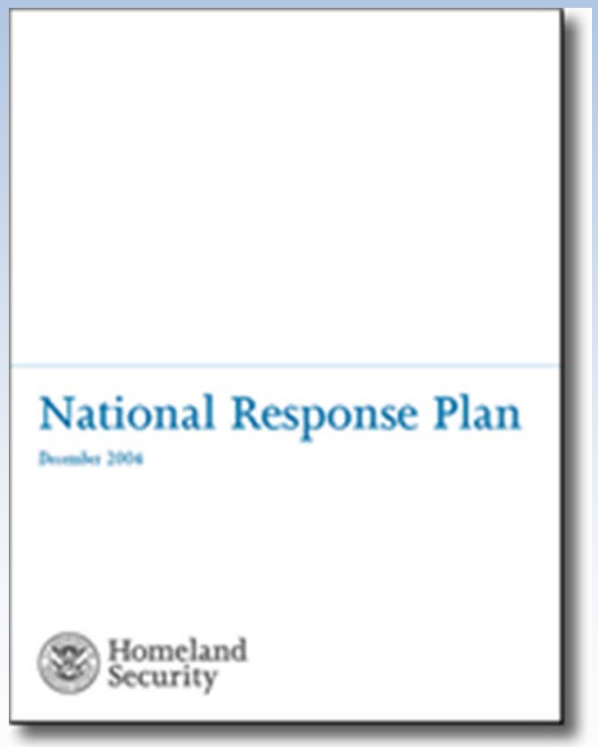
Incident Coordination Mandate Background

- 1992 – Federal Response Plan issued
  - Common incident-management framework
  - Coordinate Federal Agencies' roles
- 2004 National Response Plan issued
  - Enhanced incident management and response
  - Incorporate State, local, and private
- 2008 – National Response Framework
  - Updated response approach to natural and manmade disasters



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EPA's Role in Source and Package Tracking

- Under the NRIA, EPA is responsible for Federal response to orphan radioactive sources
- Goals of EPA's Radiation Protection Program
  - Promote responsible management or radiation sources and materials
  - Protect people and the environment from unnecessary exposure
  - Develop and implement protocols to reduce number of responses

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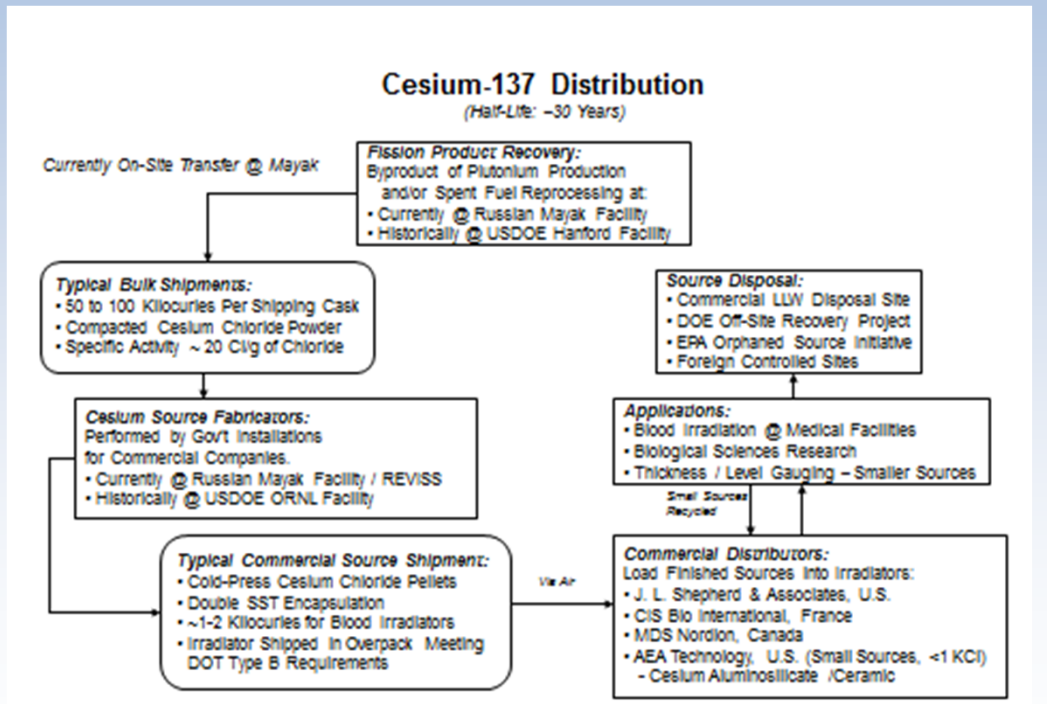
EPA's Role in Source and Package Tracking

- To meet the goal of reducing incidence of orphan sources, EPA began investigating Tracking Technologies
- EPA established an interagency agreement with DOE and the Oak Ridge National Laboratory
- The project is called Radiological Source Tracking and Monitoring (RadSTraM)



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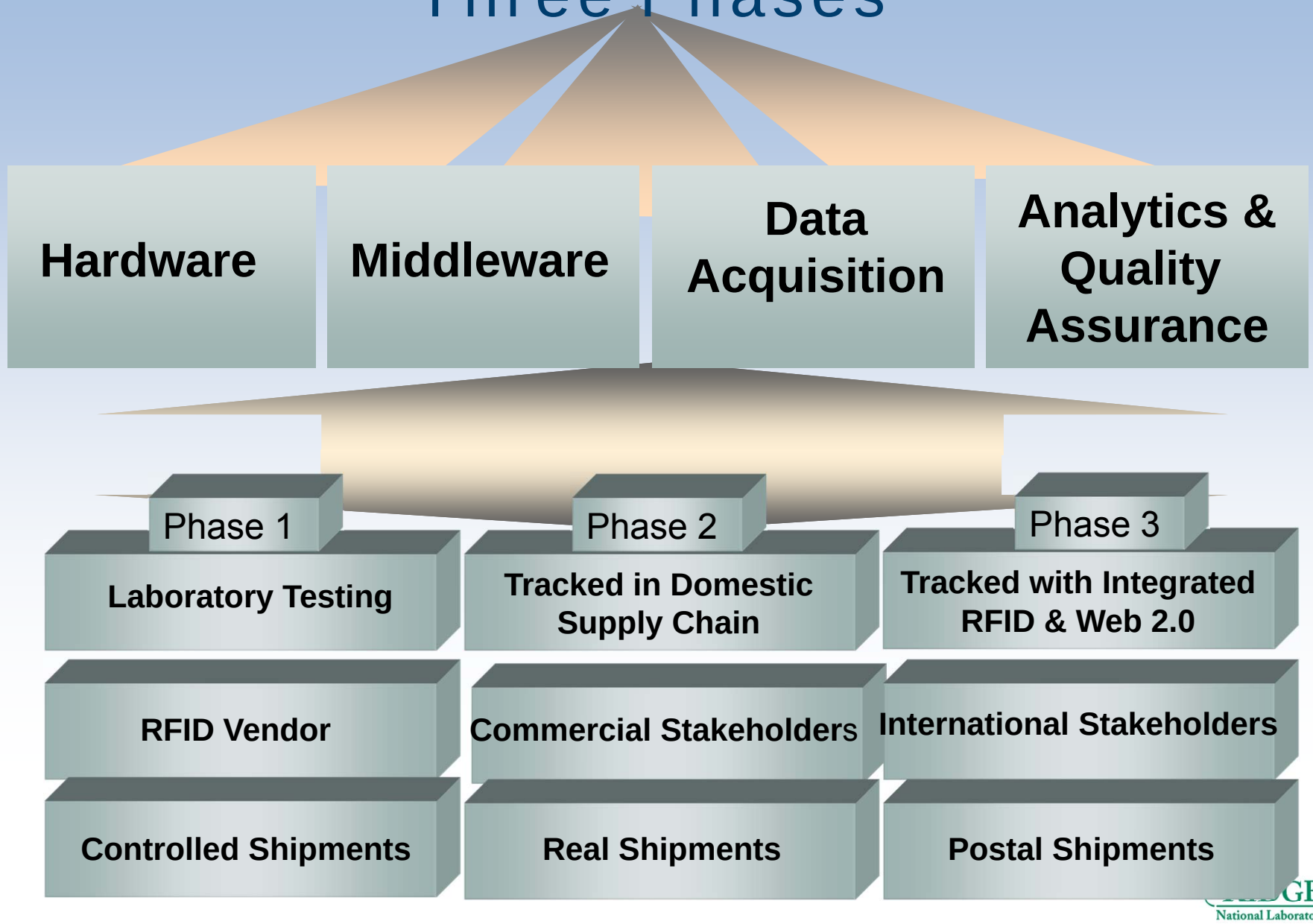
RadSTraM was Performed in Three Phases



RadSTraM Phase I

RFID Sensors embedded in Type A packages

Radiation monitors at a Tennessee State weigh station were also employed

Remote Sensor

Electronic Seal

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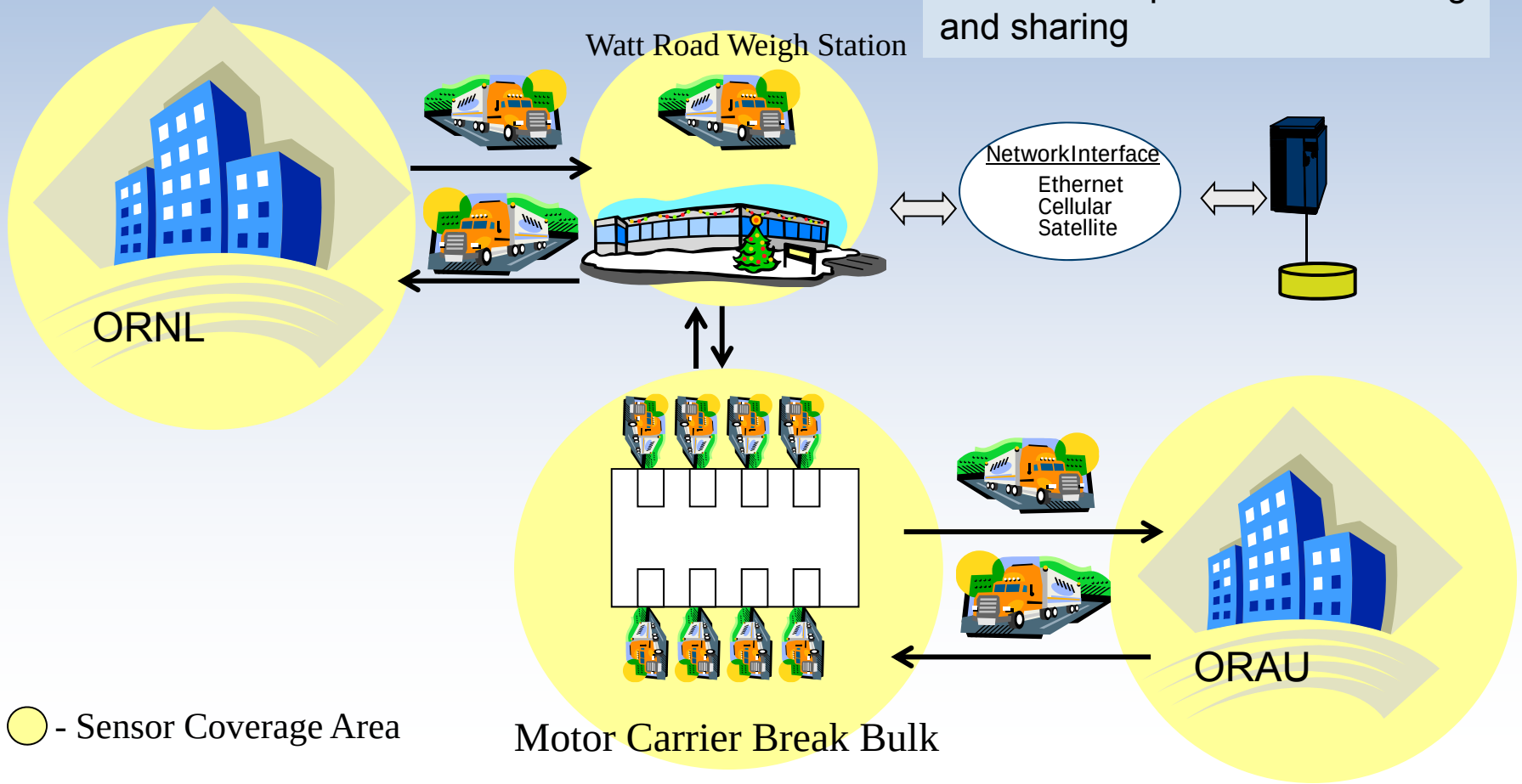
Phase I Controlled Environment "In Commerce" Test

The hardware concept proved valid, but a central database was needed to improve data handling and sharing



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RadSTraM: Phase II

- Used procedures, protocols, lessons learned from Phase I
- Shipped medical radioisotopes between a commercial facility (Massachusetts) and ORNL (Tennessee)
- Used a combination of express air and truck

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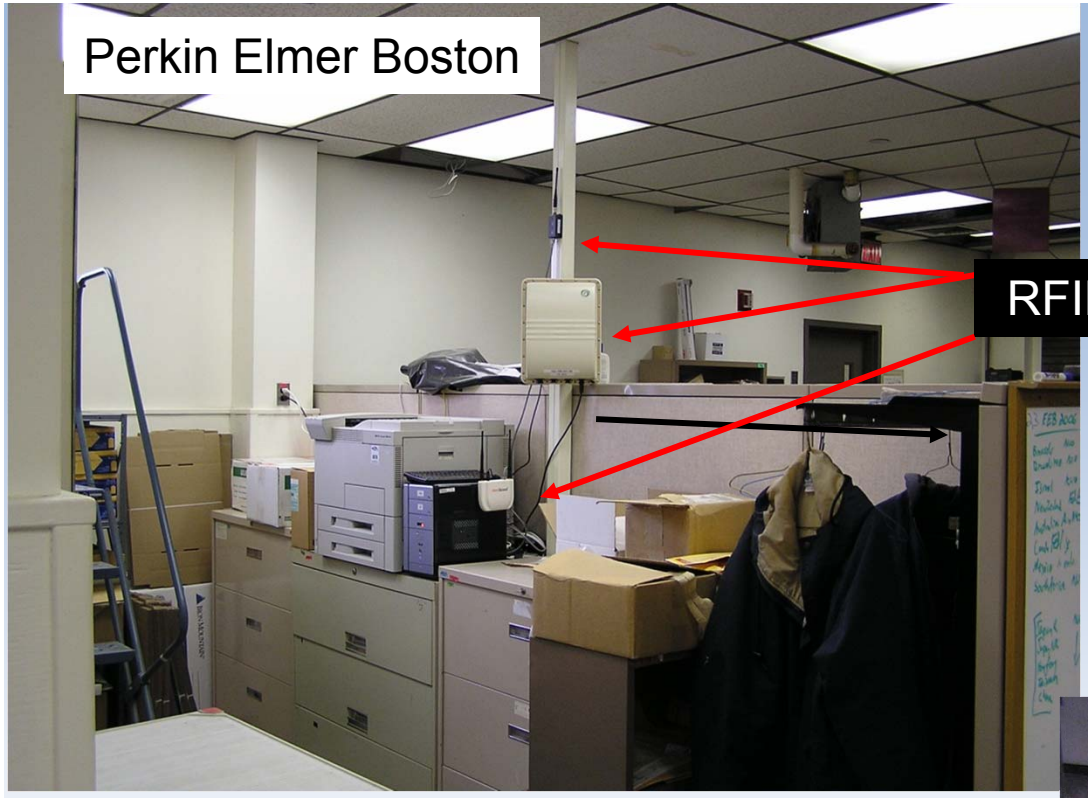
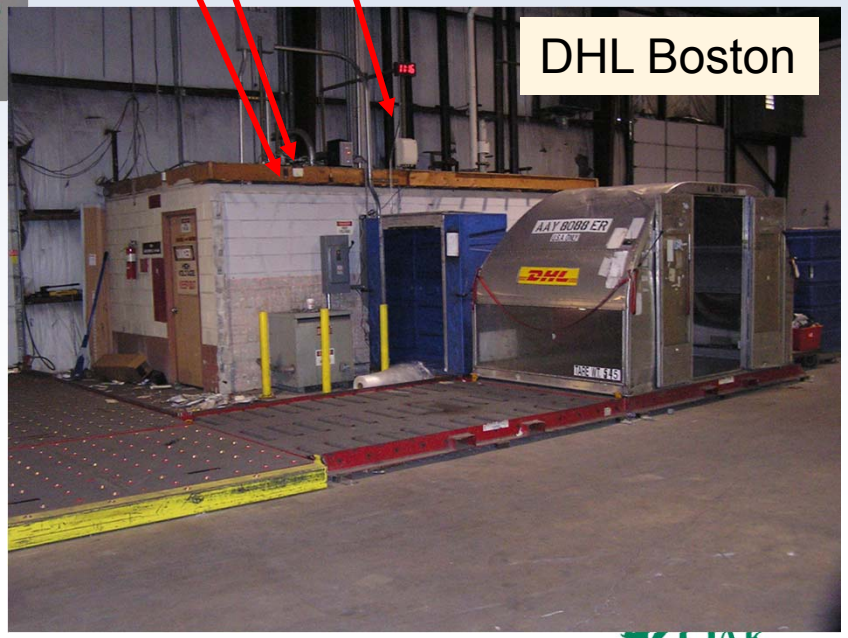
RadSTraM Phase II



RFID Readers



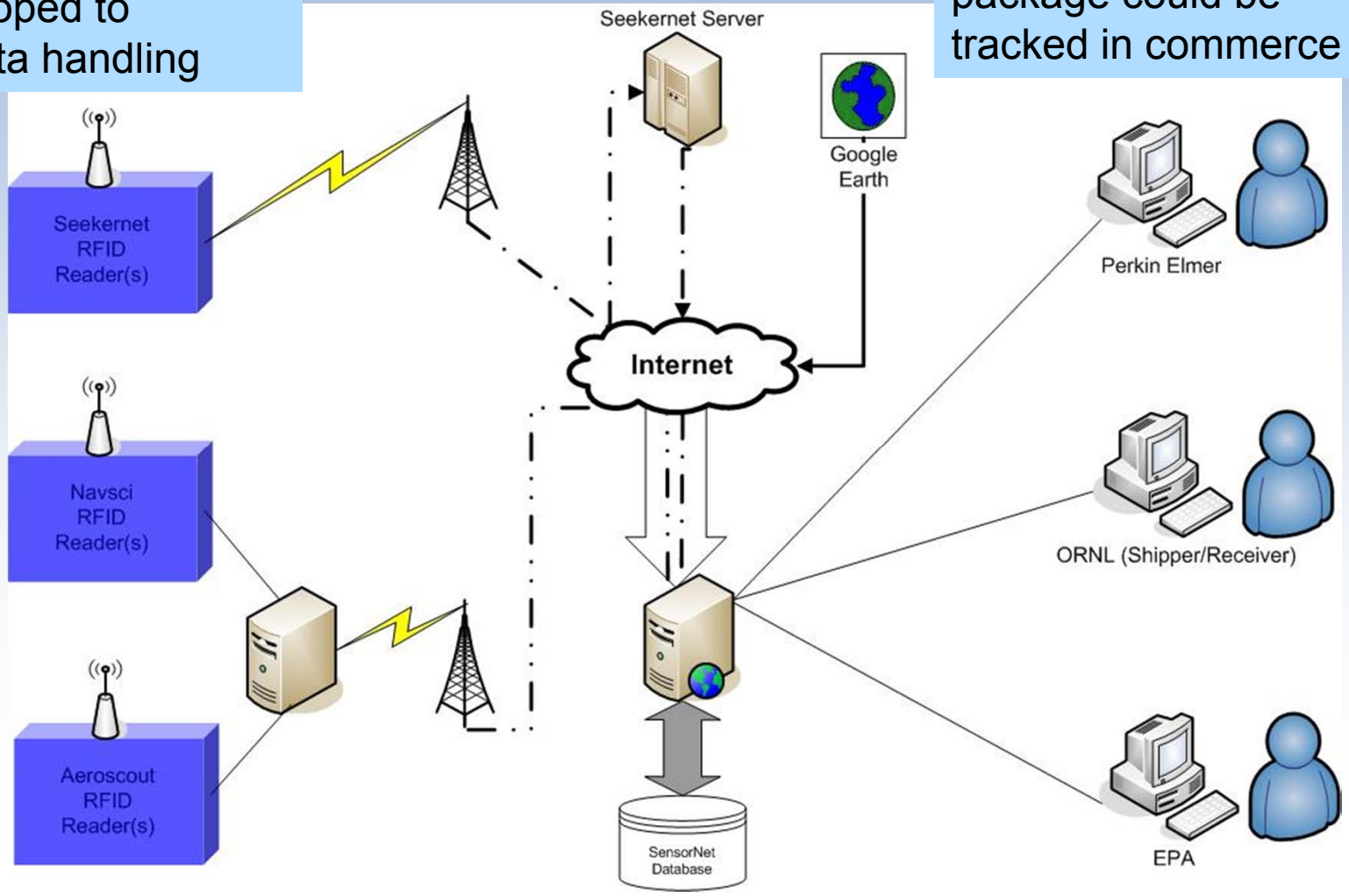
Used Procedures and protocols learned from Phase I

Used three different RFID Sensor Vendors.

Phase II Configuration

A database and web client were developed to improve data handling

Proved that a RAM package could be tracked in commerce



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EPA RadSTraM: Phase III

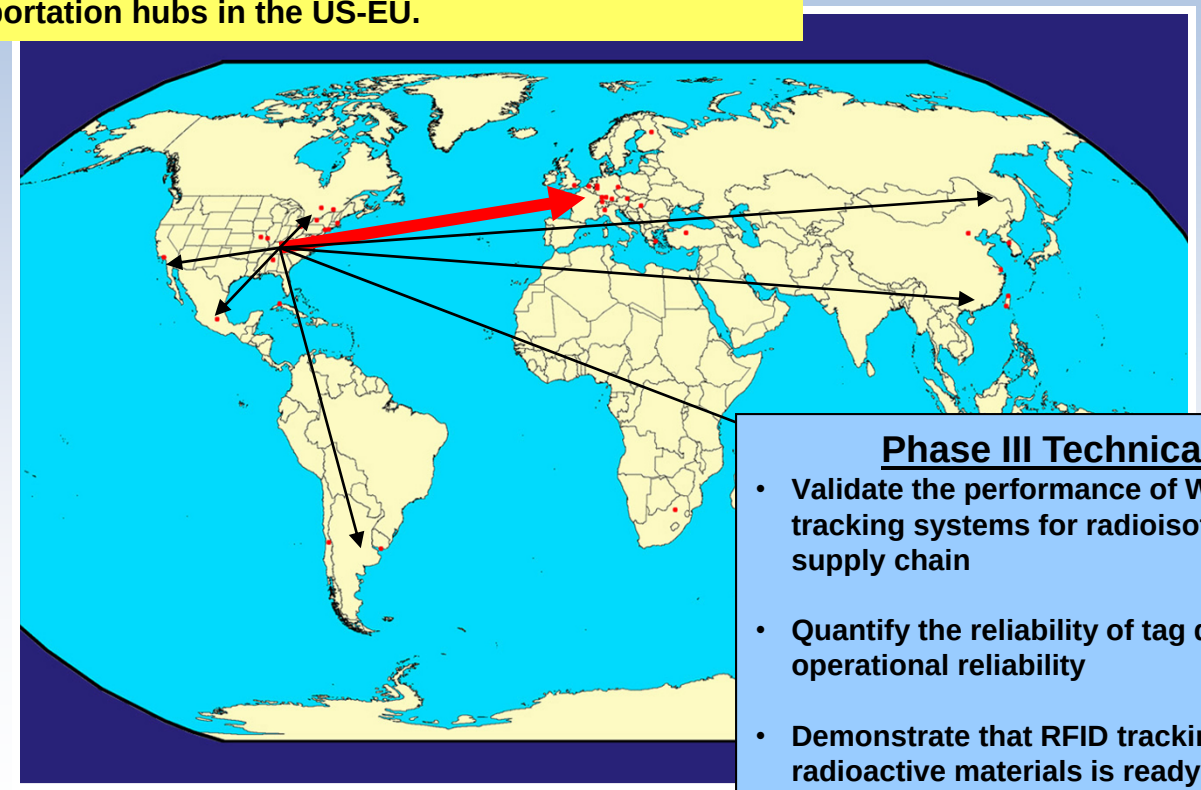
To further develop and test the integration of hardware and software using emerging Web 2.0 technology

Project selected by the U.S. Department of Commerce (DOC) and the European Union to be part of an international demonstration project for RFID development

- Thus became part of Phase I of the Global Radiological Source Sorting, Tracking, and Monitoring (GRadSSTraM) Project

Phase III Collaboration between US and EU to Develop a Global Radioisotope Sorting Tracking and Monitoring Demonstration (GRadSTraM)

ORNL, EPA, USPS, DOE, DOC and EU collaborated to develop a transatlantic radioactive material supply chain tracking pilot using multi-modal transportation hubs in the US-EU.



Example of DOE-ORNL Medical and Research isotope supply chain

Phase III Technical Objectives:

- **Validate the performance of Web 2.0-enabled RFID tracking systems for radioisotopes in the international supply chain**
- **Quantify the reliability of tag detection and operational reliability**
- **Demonstrate that RFID tracking and monitoring of radioactive materials is ready for testing using commercial radioisotope shippers and carriers**
- **Demonstrate information security using a faceted classification system architecture**

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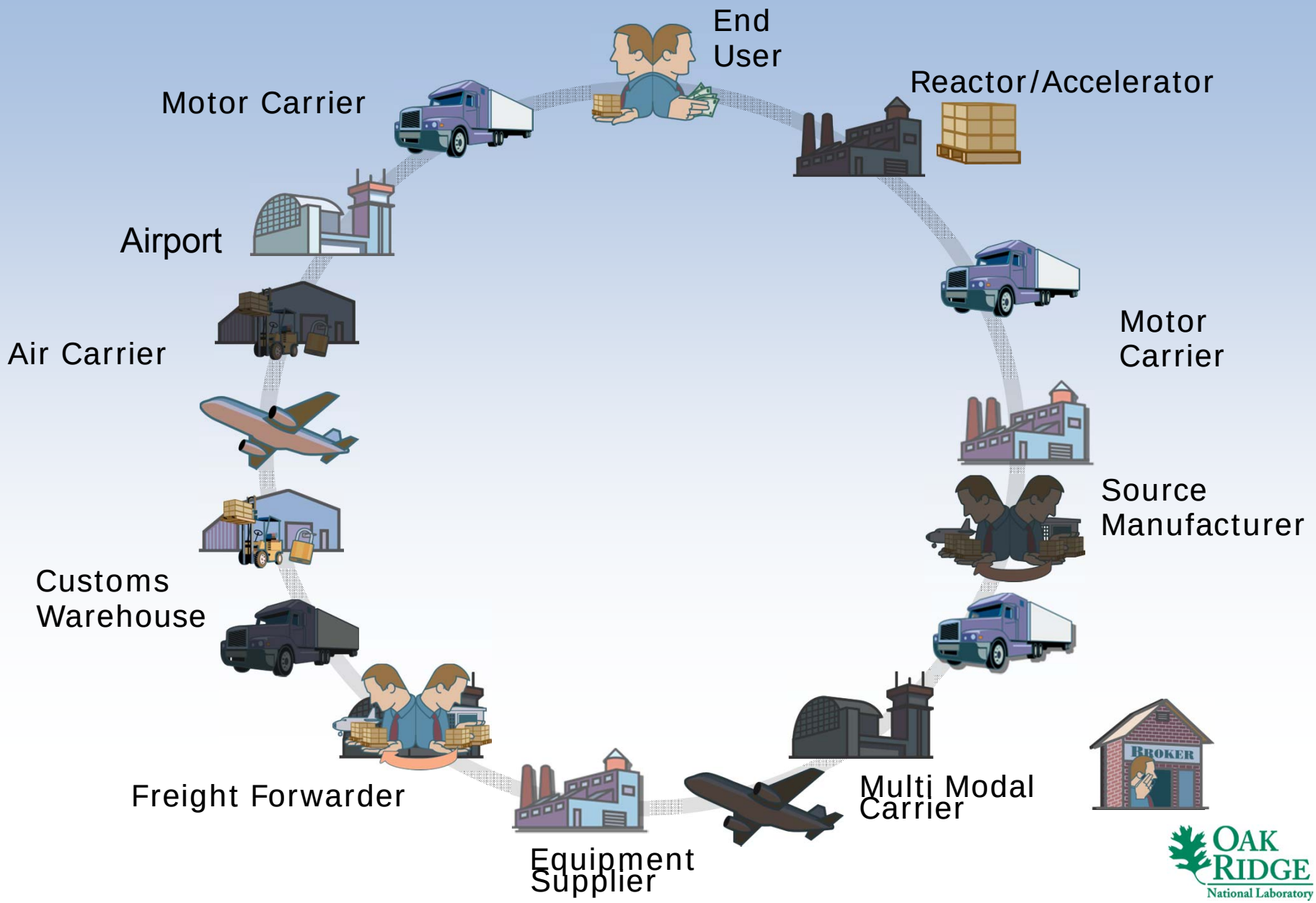
Current RAM Supply Chain is not Connected



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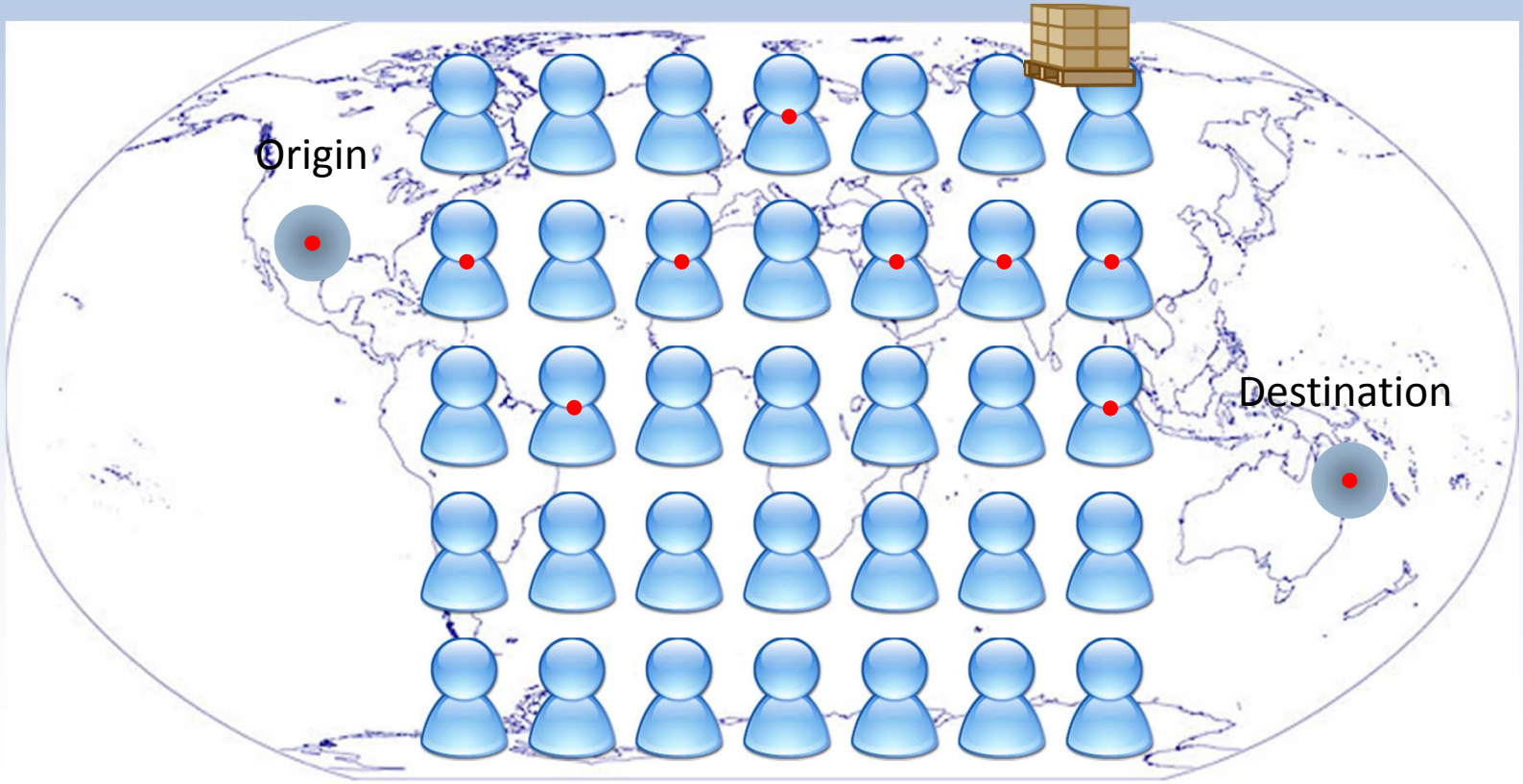
Problem: Connecting the Dots in Global RAM Supply Chain



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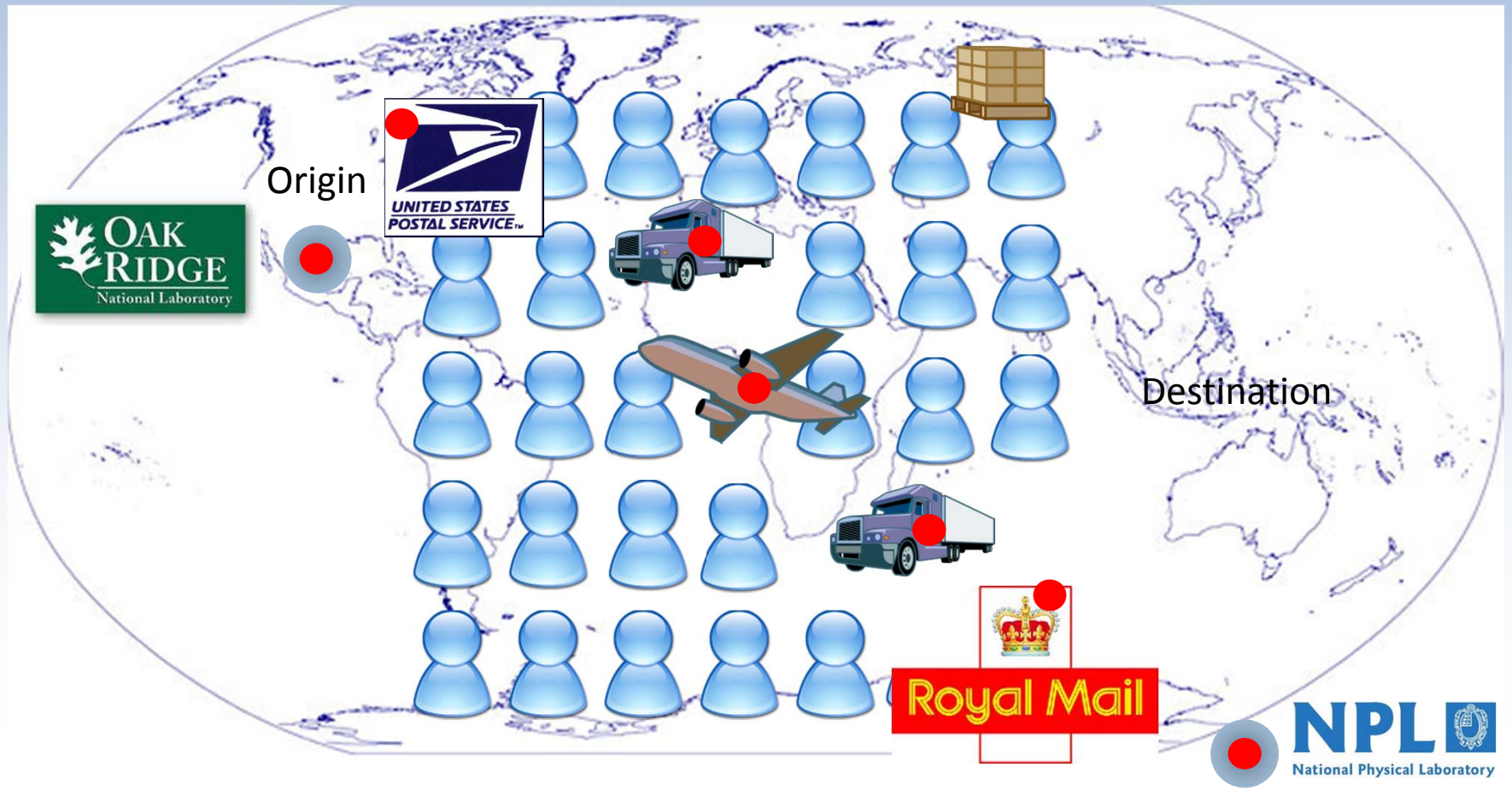
GRadSTraM Goal was Connect the Dots



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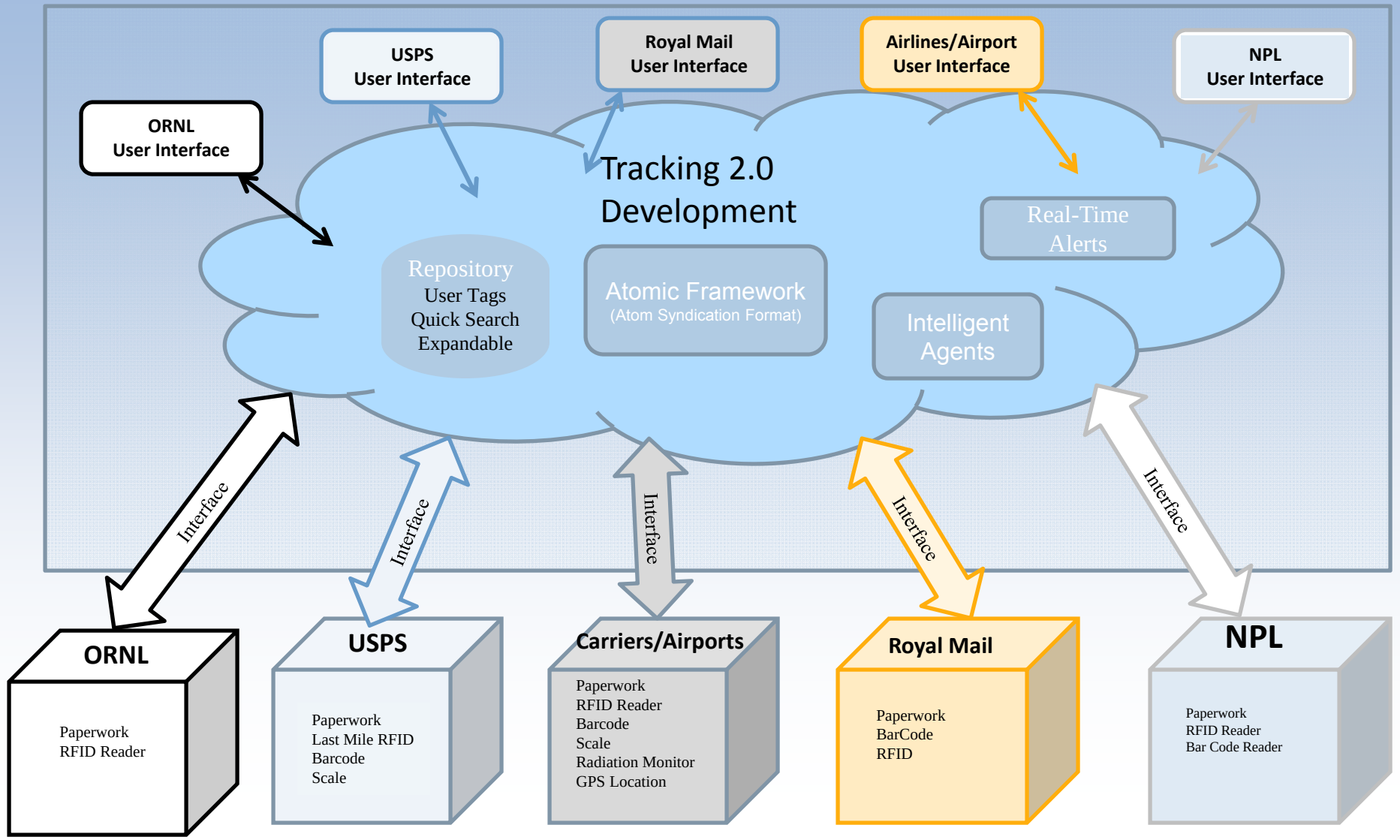
How Tracking with Web 2.0 Works



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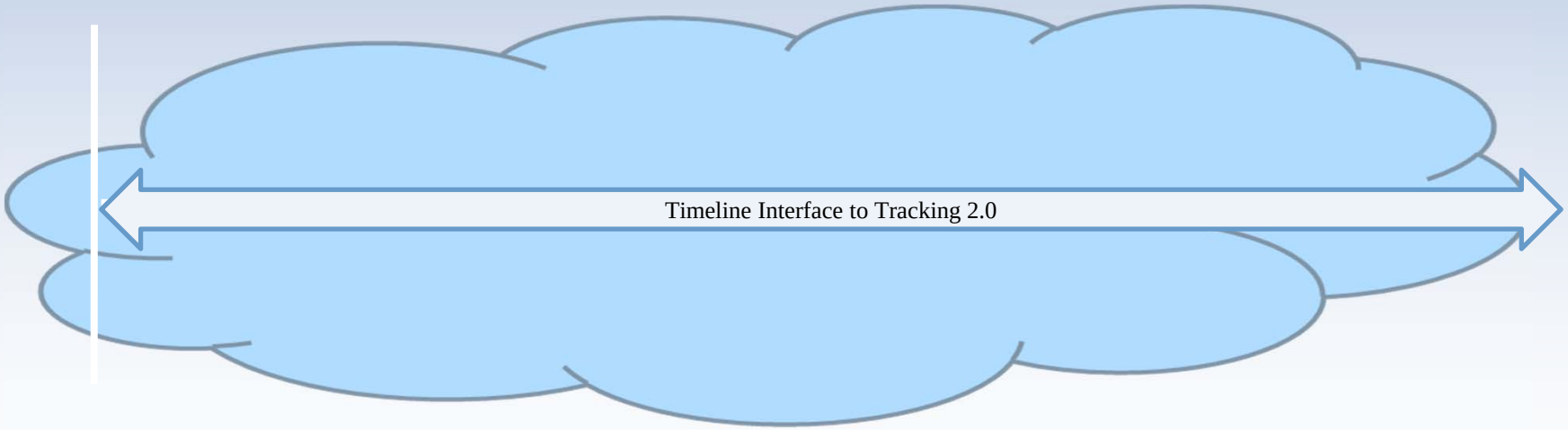
How GRadSTraM Works



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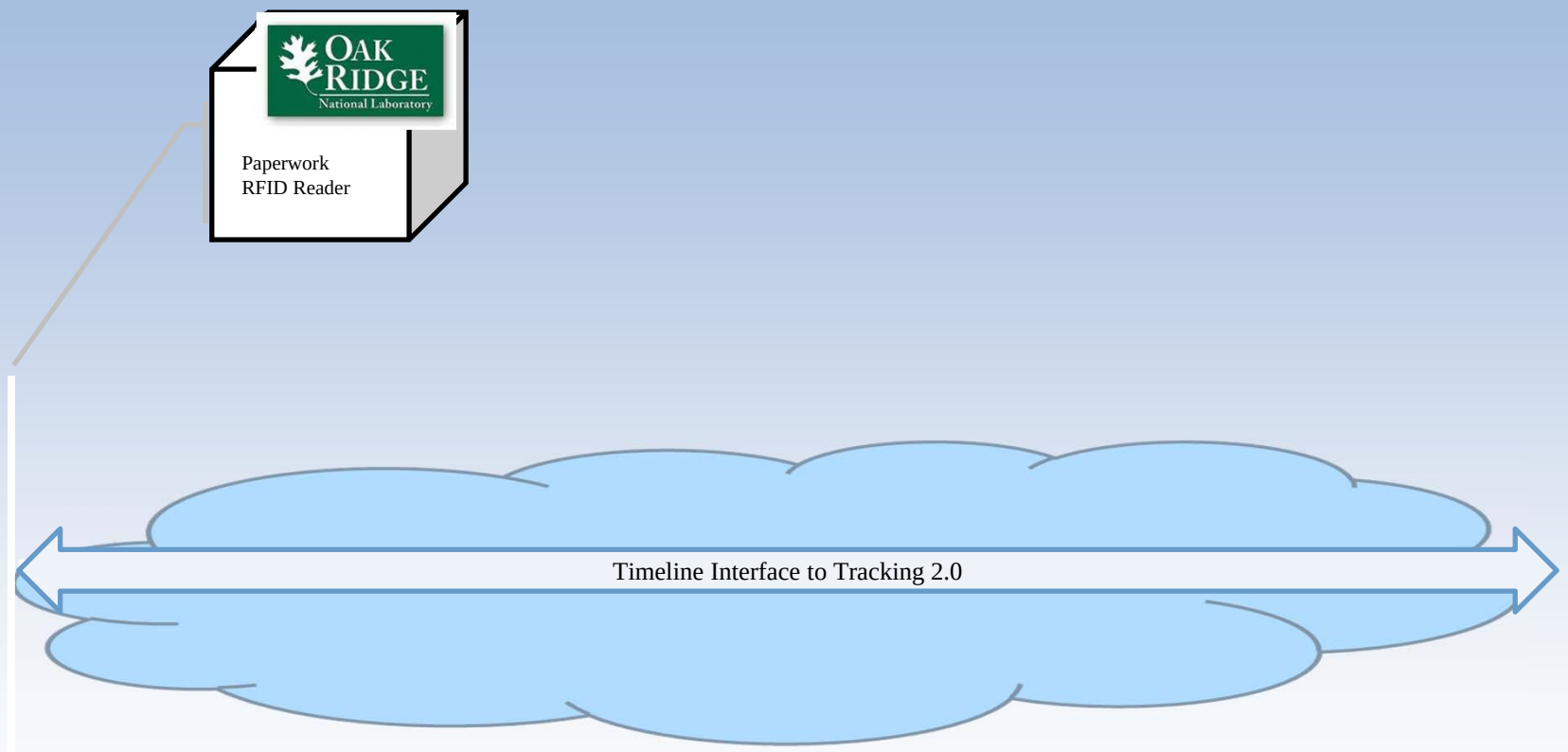
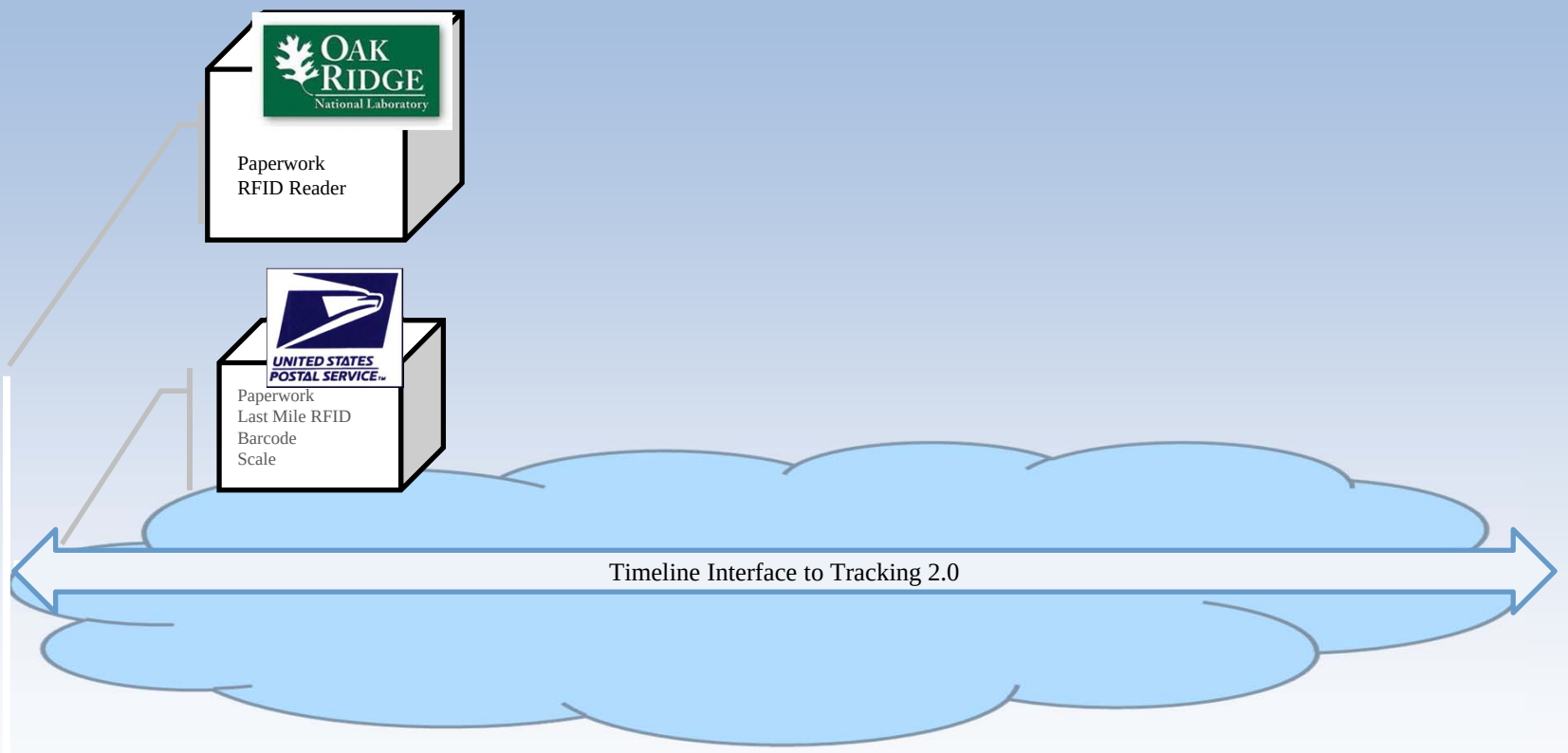
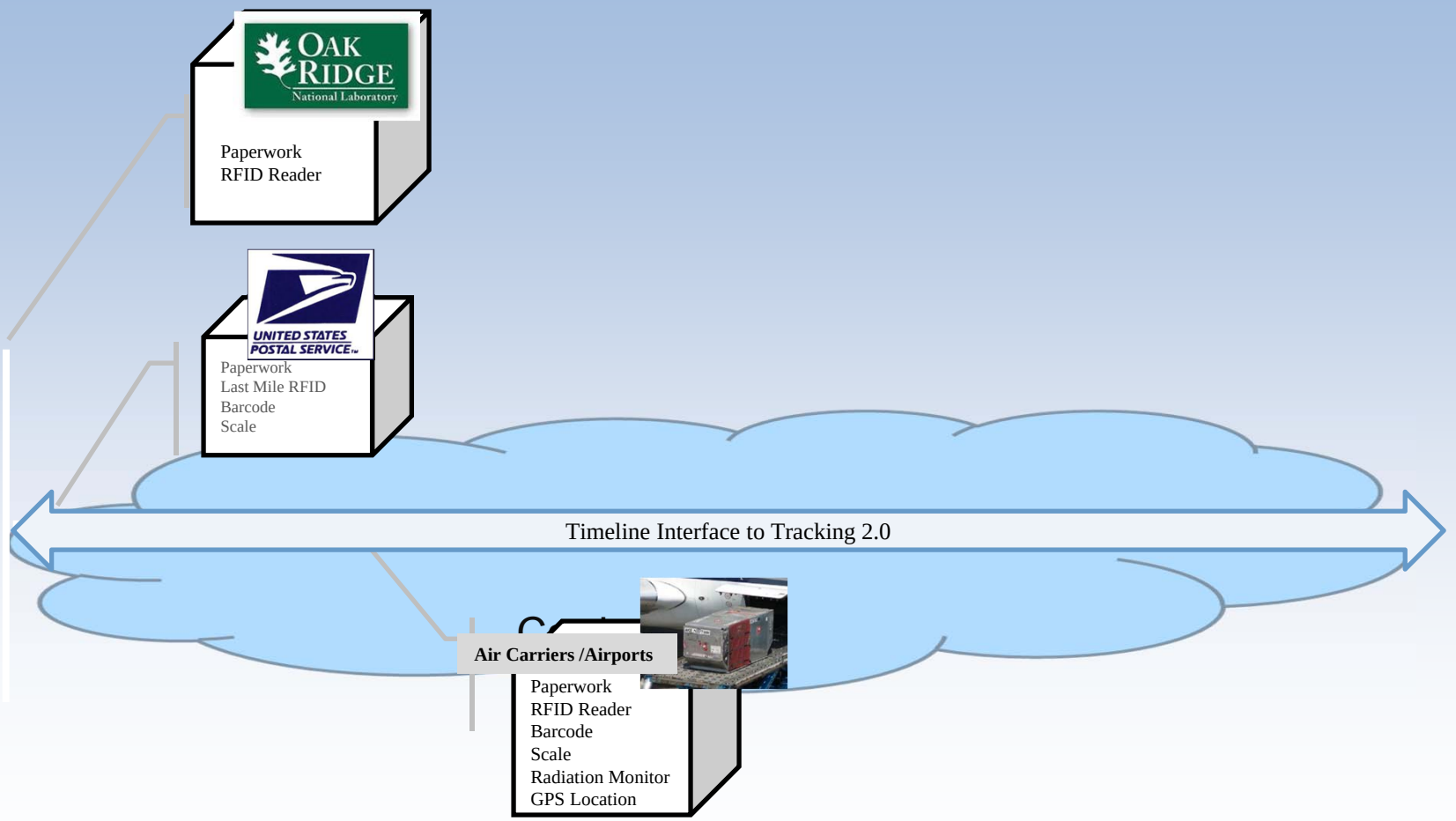
How GRadSTraM Works



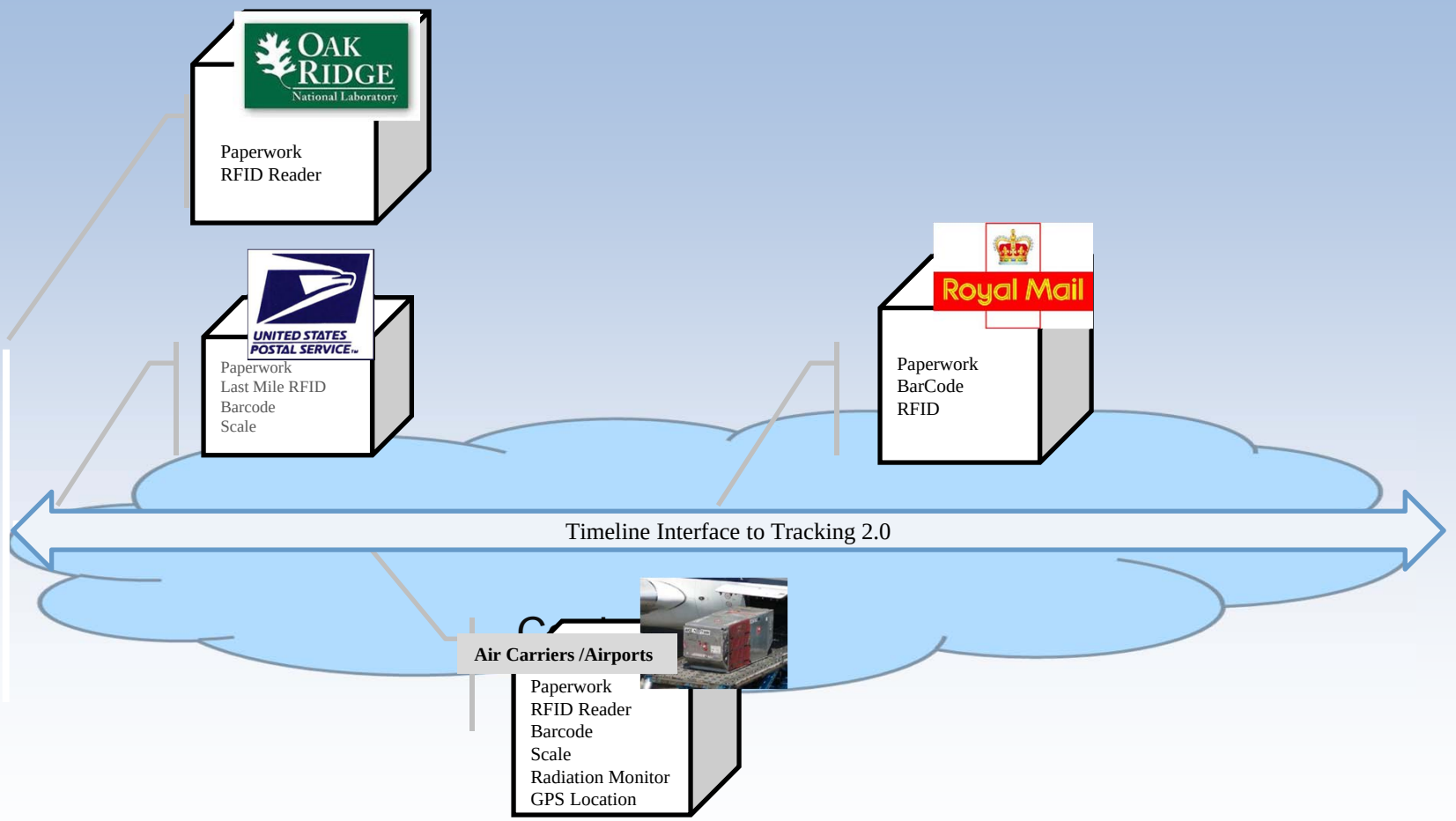
How GRadSTraM Works



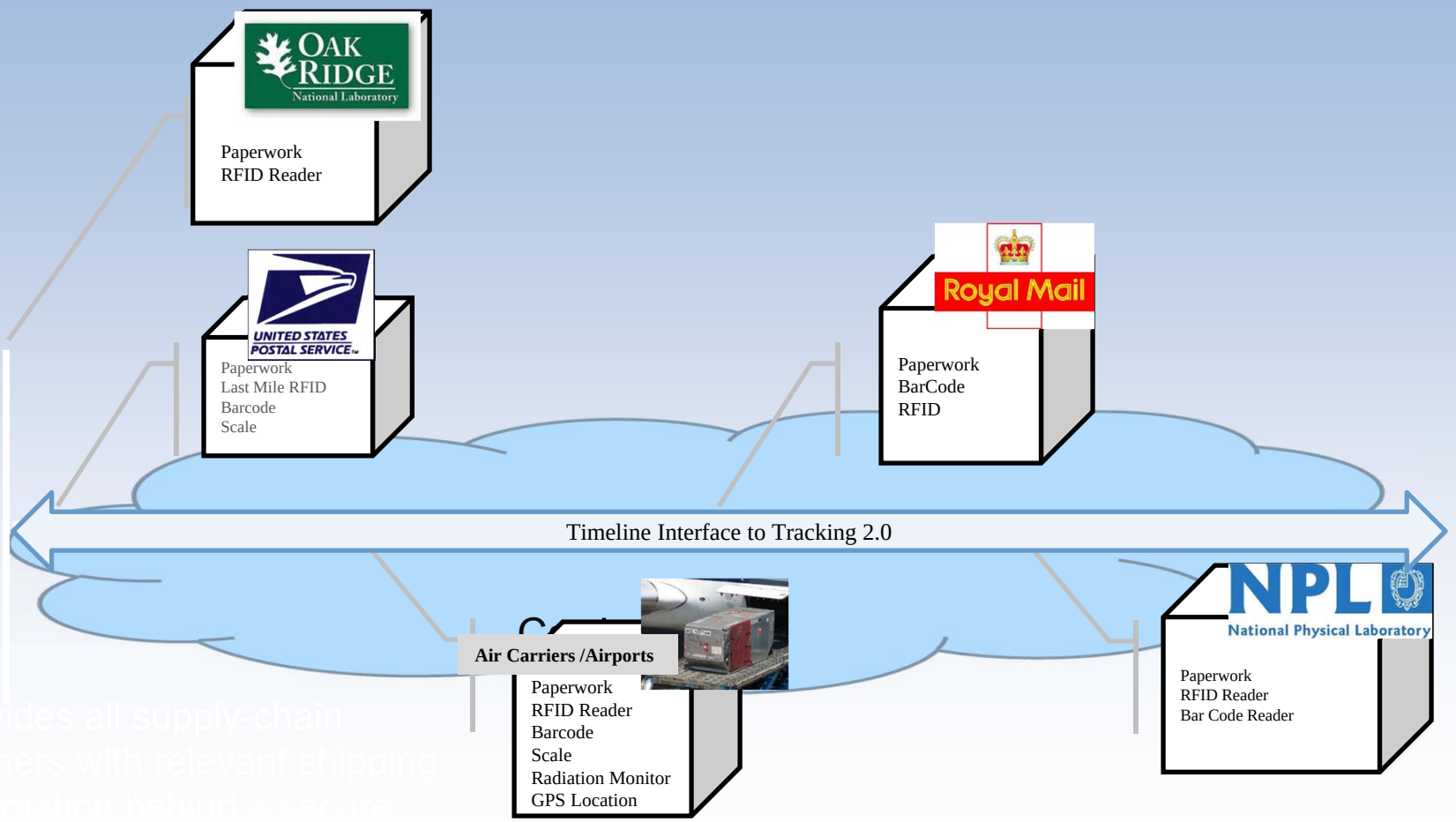
How GRadSTraM Works



How GRadSTraM Works



How GRadSTraM Works



- Provides all supply-chain partners with relevant shipping information behind a secure firewall
- Leverages existing investments in current proprietary tracking systems
- No large capital outlay to participate

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GRadSTraM Scorecard

- Validated Web 2.0 enabled RFID tracking systems for radioisotope shipments

- Combining RFID Sensor and Web 2.0 technologies enhances compliance with current regulatory tracking requirements

- GRadSTraM is ready for a Phase II Demonstration using a commercial isotope supply chain and next generation sensor technologies

- DOE is willing to offer their National Isotope supply chain as demonstration platform

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Next Step for Tracking 2.0

CORAR **NNSA** **DOE**

DHS IAEA EPA NRC DOT

- Type A & B Packaging
- Cat 1-4 Source Tracking
- Special Form

Mutually Agreed Protocol for Data Sharing

Embedded Sensor Technology in Next Generation RAM Packages

- National Source Tracking System
- Radioactive Materials in Quantities of Concern
- High Consequence Dangerous Goods

Embed in Supply Chain via integrated Software and Hardware Technologies

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