High Level Architecture Compliance: Source Term Estimation Demo

Ian Griffiths

Andrew Solman

Ben Swindlehurst

High Level Architecture Compliance Program Aims

- Support other Dstl-JSTO tasks
  - Allow testing of components in larger simulation
  - Allowing components to be demonstrated
  - Allowing components to be exploited in experimentation events
- Focuses on one JSTO task each year
  - Year 1: Source Term Estimation (STE)
  - Year 2: Chemical and Biological Effects on Operations (Impact Assessment Tool)
  - Year 3: Fusion of Sensor and Model Predictions

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Use of HLA

- High Level Architecture
  - Mechanism that enables simulations to communicate and collaborate
  - Developed by Defence Modeling and Simulation Office (DMSO)
  - Now IEEE standard (IEEE 1516)
- Used because provides framework for Modelling and Simulation interoperability
  - Could use other mechanisms

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Year 1 Progress: STE Demo (1)

- Aim was to provide demonstration of the STE task capability
  - Allows testing within a realistic simulated world
  - Shows the role of STE in an example system
- Built upon previous M&S efforts
  - Real-time CB synthetic environment
  - Chemical Agent Detector (CAD) models
  - Prototype warning and reporting system

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Year 1 Progress: STE Demo (2)

- Updated detector models providing continuous bar readings
- Integrated Source Term Estimation modules
  - Geometric STEM
  - STEM I
  - STEM II
- New or updated HLA interfaces throughout to reflect new and enhanced components

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STE Demo Components

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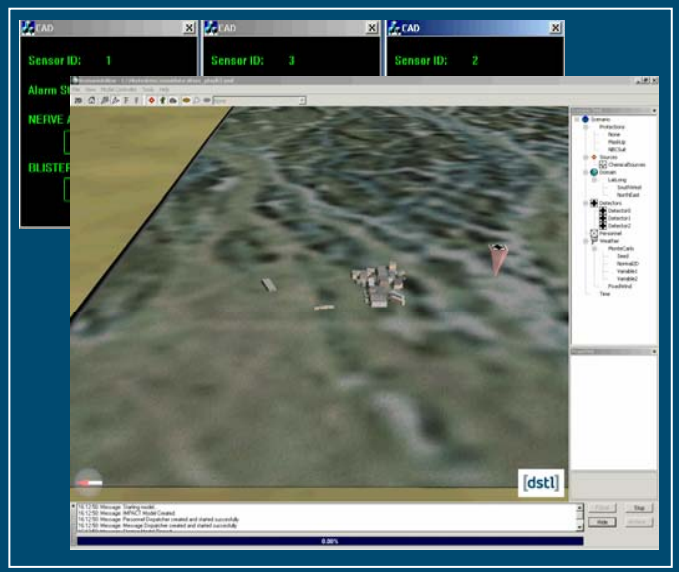
STE Demo Components



PC 1 - God's view

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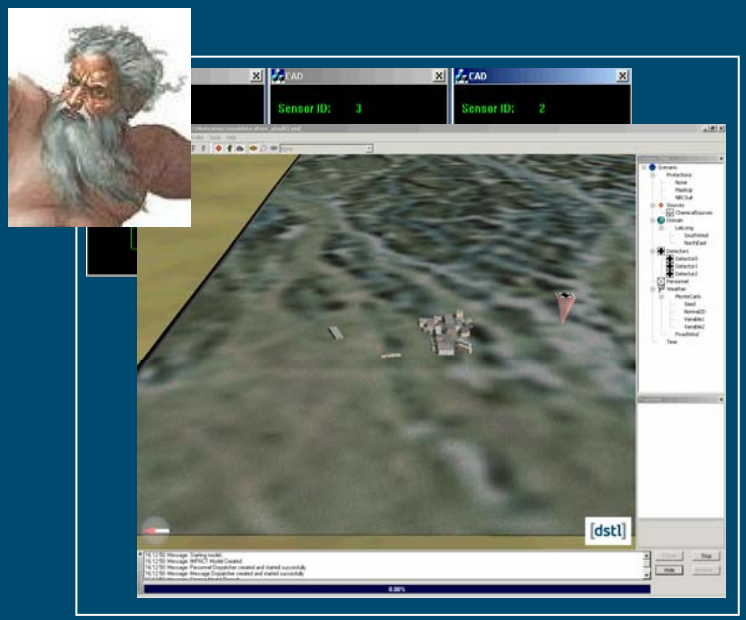
STE Demo Components



PC 1 - God's view

- Met server
- Release generator
- CBSim - Real-time CB synth. env.
- CBSim Visualiser - ground truth view
- CAD bar detectors

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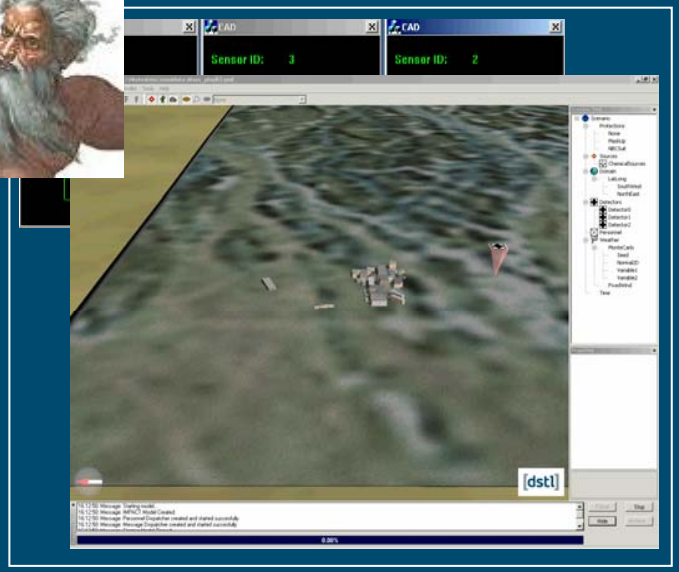
STE Demo Components



- CBSim provides ground truth of CB event
  - Realisation of plume dispersing in meandering wind field
  - Includes
    - FACTS wind flow model
    - MEANDER turbulence model
    - UDM puff model
    - In-cloud concentration fluctuation model

PC 1 - God's view

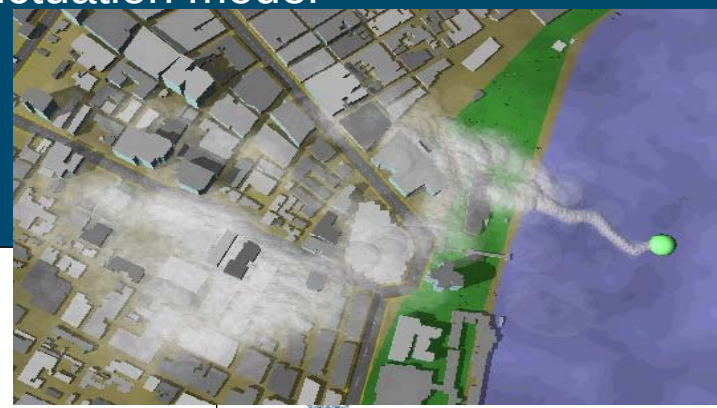
Met server

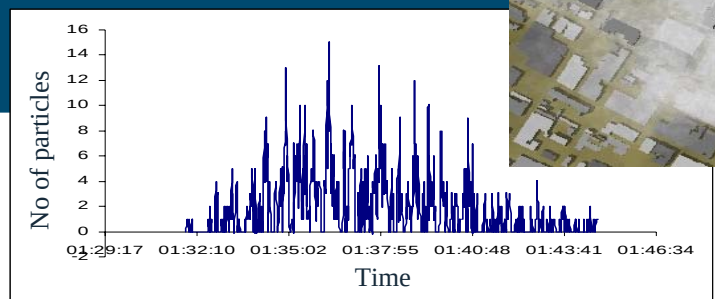
Release generator

CBSim - Real-time CB synth. env.

CBSim Visualiser - ground truth view

CAD bar detectors





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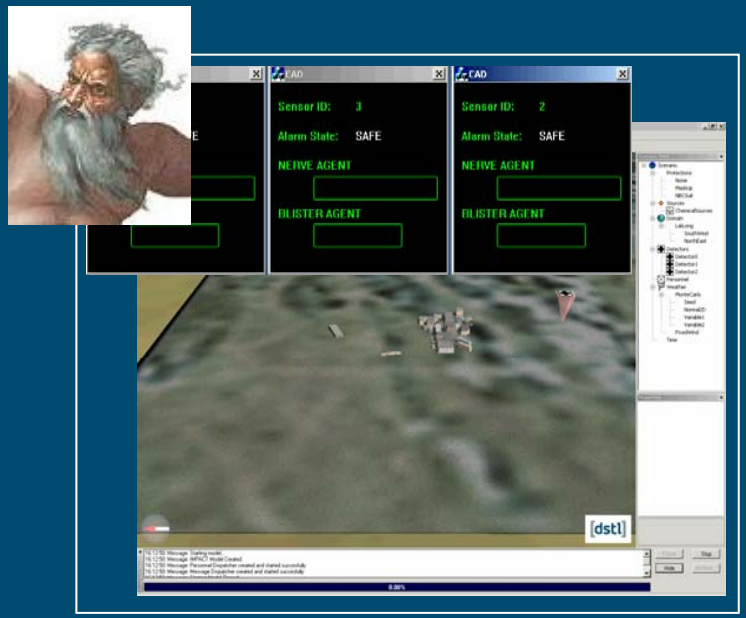
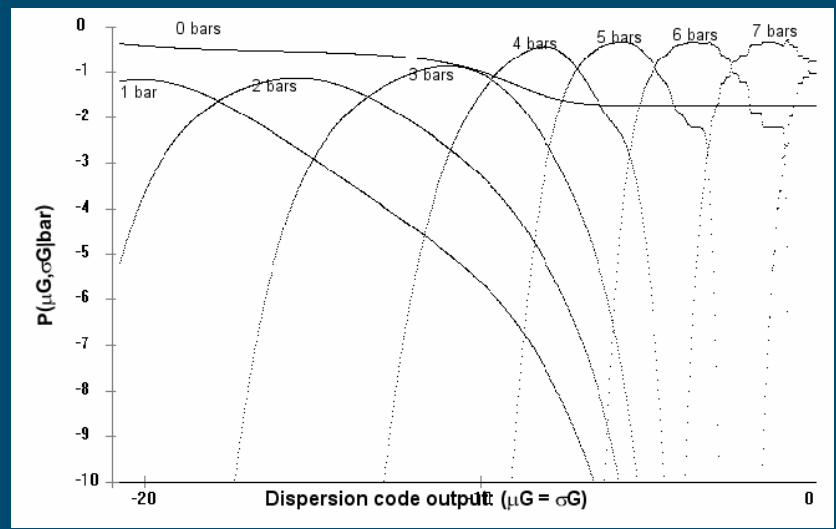
STE Demo Components



- CBSim provides ground truth of CB event
- Stimulates chem detectors
  - Simulated detectors respond to modelled challenge



PC 1 - God's view

Met server

Release generator

CBSim - Real-time CB synth. env.

CBSim Visualiser - ground truth view

CAD bar detectors

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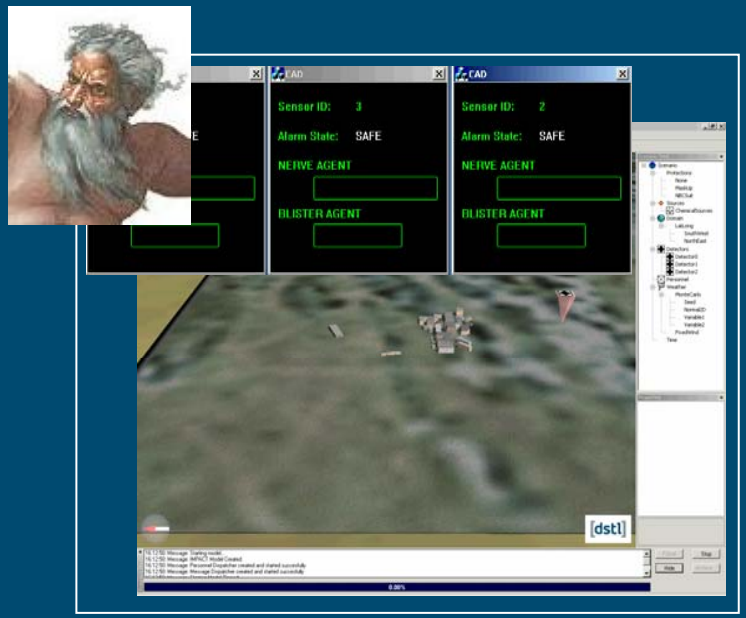
STE Demo Components



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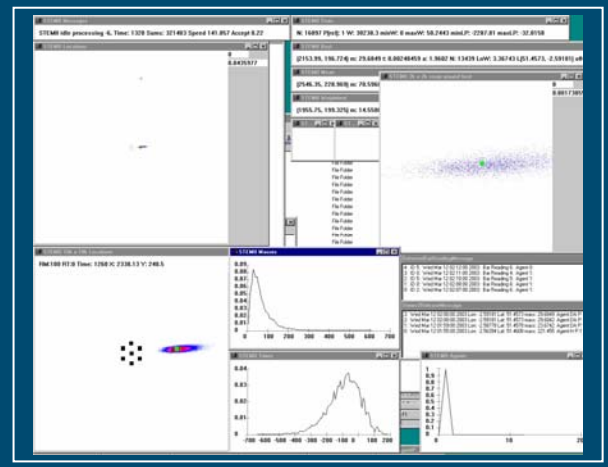

PC 2 - Boffin's view

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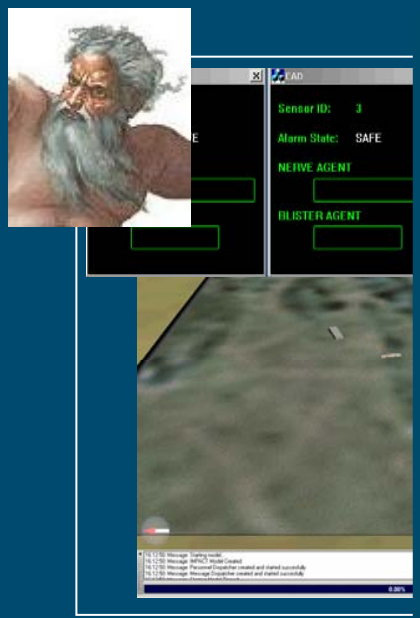
STE Demo Components



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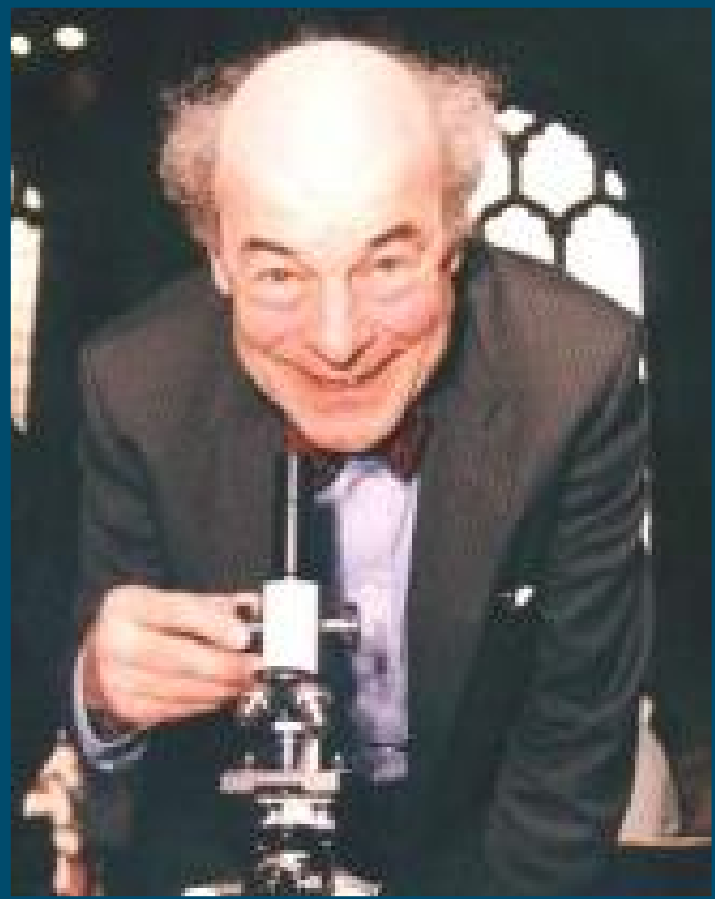

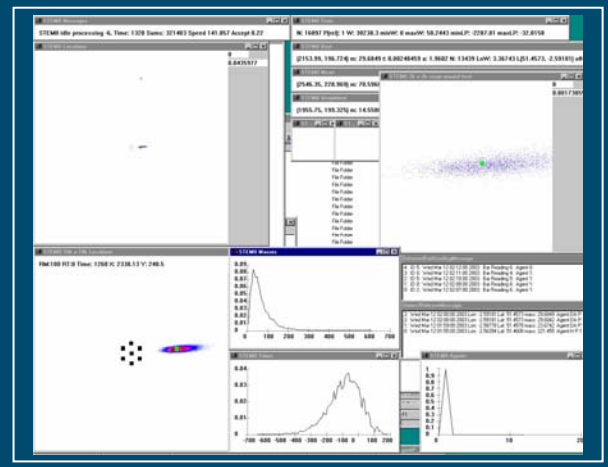

PC 2 - Boffin's view

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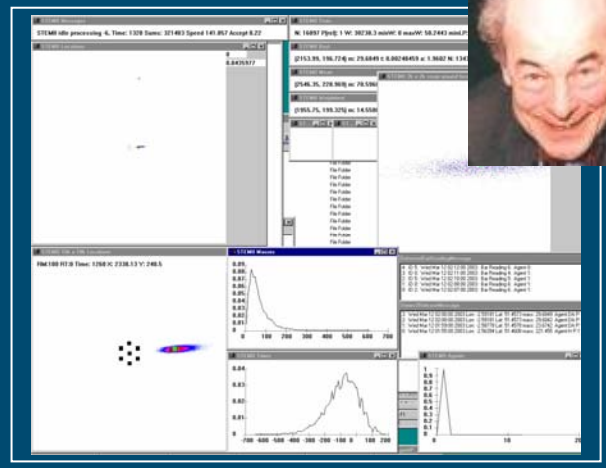
STE Demo Components

PC 1 - God's view



PC 2 - Boffin's view

Choice of

- Geometric STEM
- STEM I
- STEM II with visualiser

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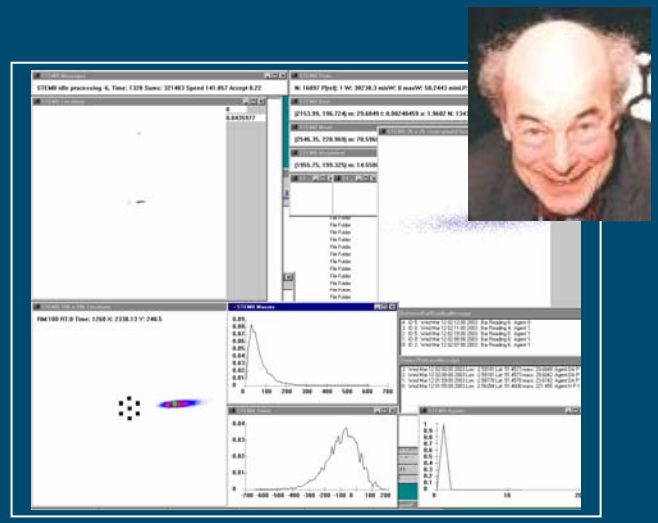
STE Demo Components

- Shows internal calculations of the inference engine
  - Hypotheses
  - PDfs for source parameters
  - Lots of other information

PC 1



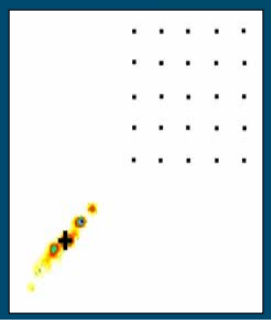
PC 2 - Boffin's view

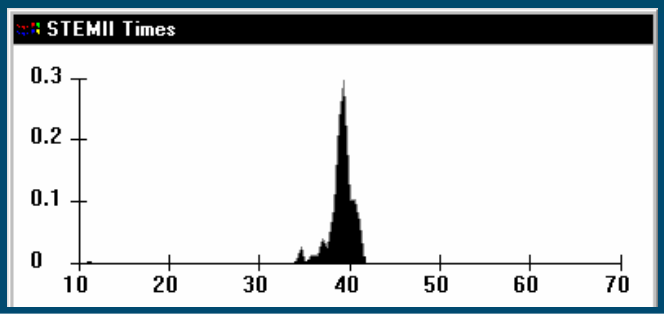
Choice of

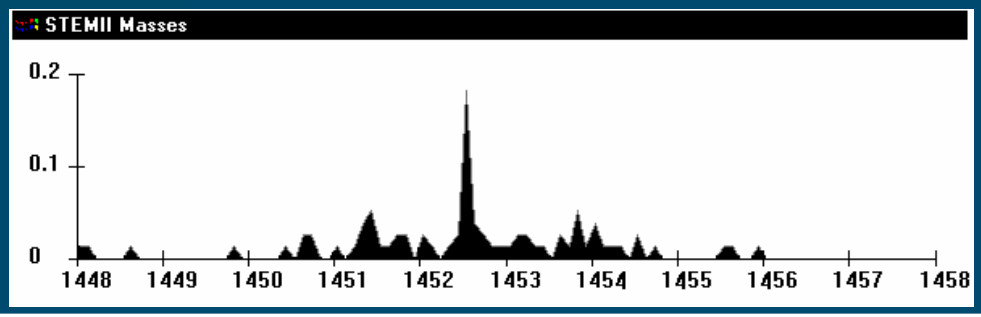
Geometric STEM

STEM I

STEM II with visualiser







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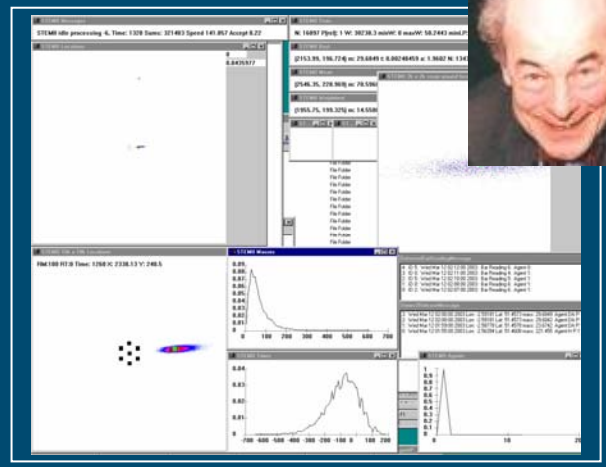
STE Demo Components



PC 2 - Boffin's view

PC 3 - Operator's view

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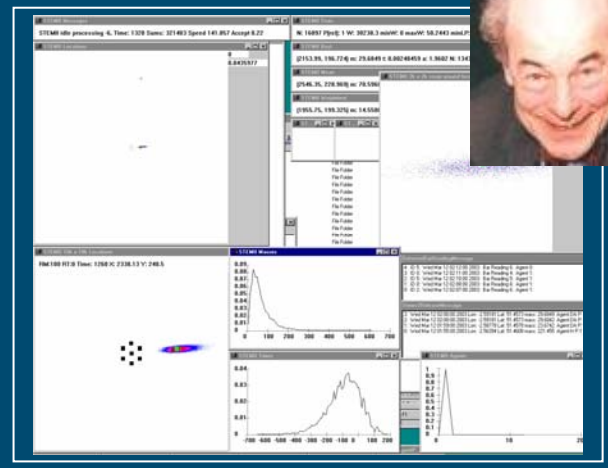
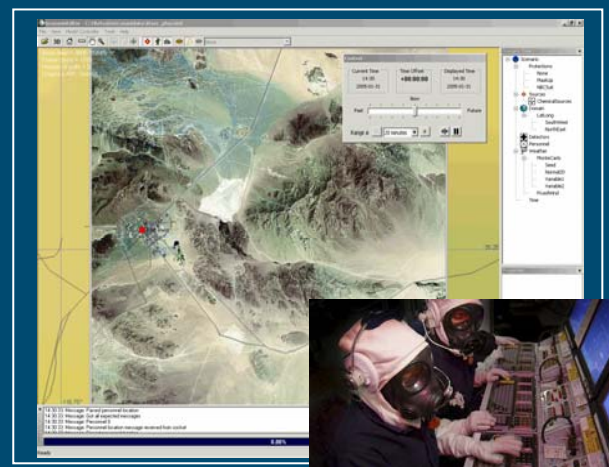
STE Demo Components

PC 1 - God's view



PC 2 - Boffin's view



PC 3 - Operator's view

Prototype W&R system

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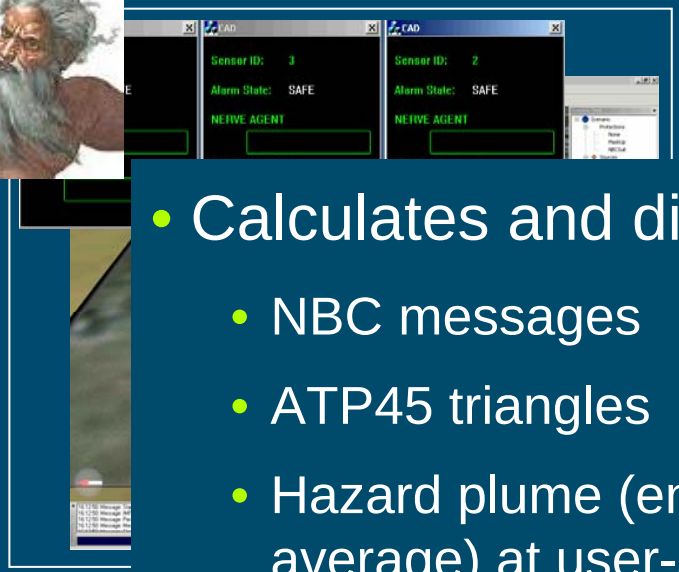
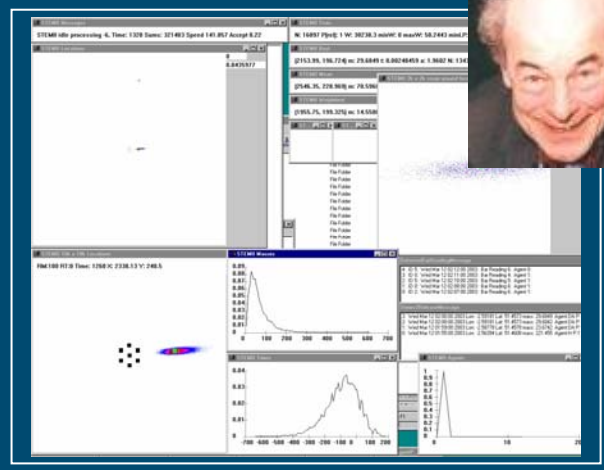
STE Demo Components

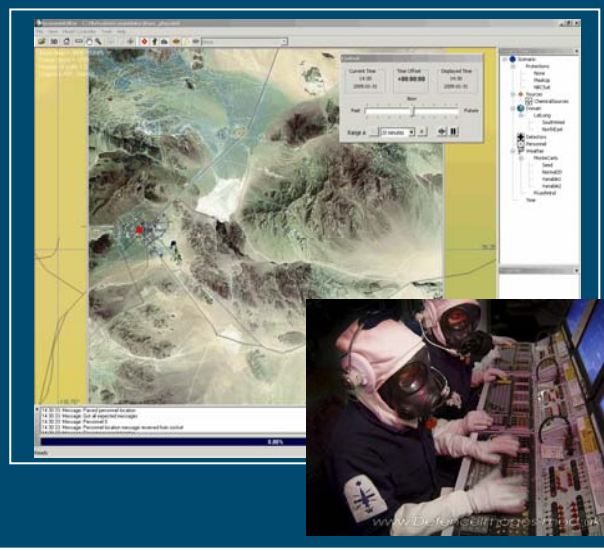


PC 1 - G

- Calculates and displays
  - NBC messages
  - ATP45 triangles
  - Hazard plume (ensemble average) at user-specified times
  - Units at risk



PC 2 - Boffin's view



PC 3 - Operator's view

Prototype W&R system

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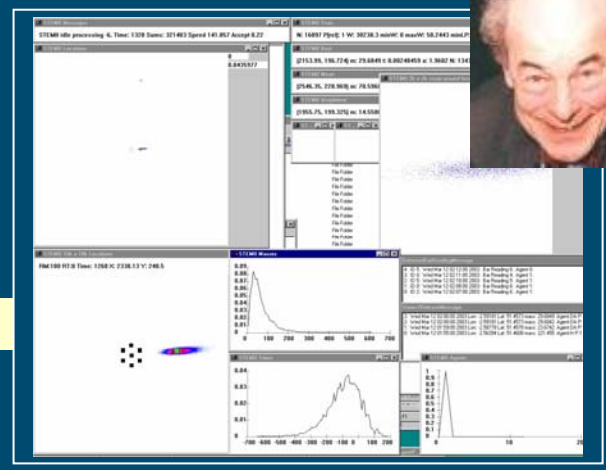
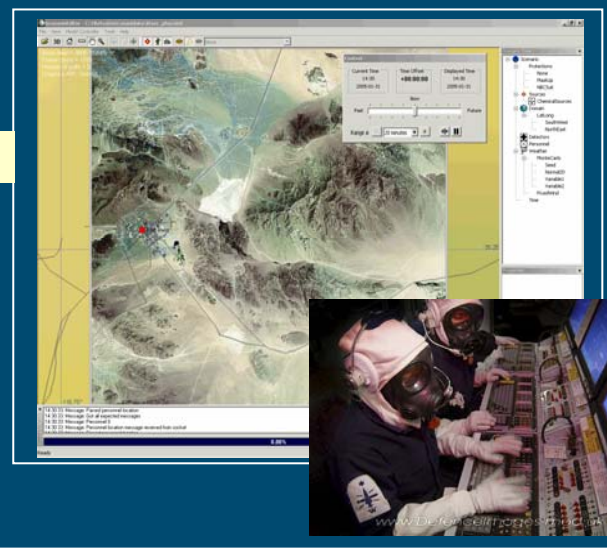
STE Demo Components

PC 1 - God's view

HLA RTI



PC 2 - Boffin's view



PC 3 - Operator's view

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Summary

- Source Term Estimation Demo
  - Shows the source term estimation capability operating in a realistic environment
    - Works in real time
    - Provides a rigorous test environment
  - Could link to other systems, including
    - Real met feeds
    - Actual detectors
    - COP applications
- Future years of HLA Compliance work prgramme will target for support further JSTO programmes

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Now the demo...

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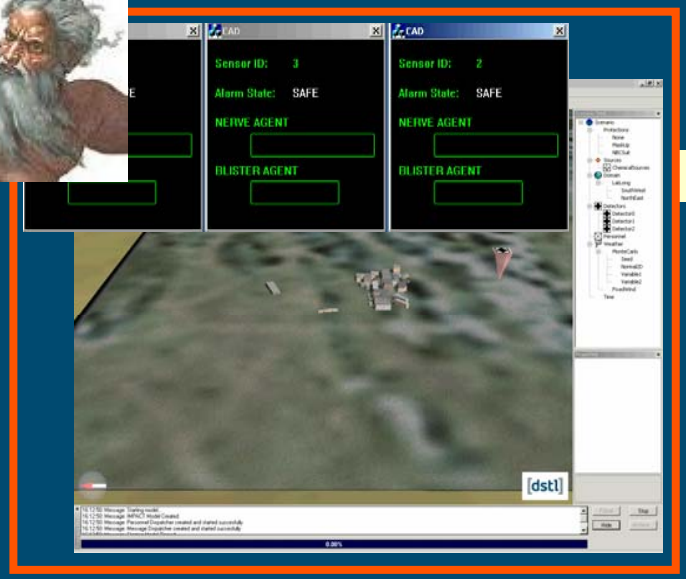
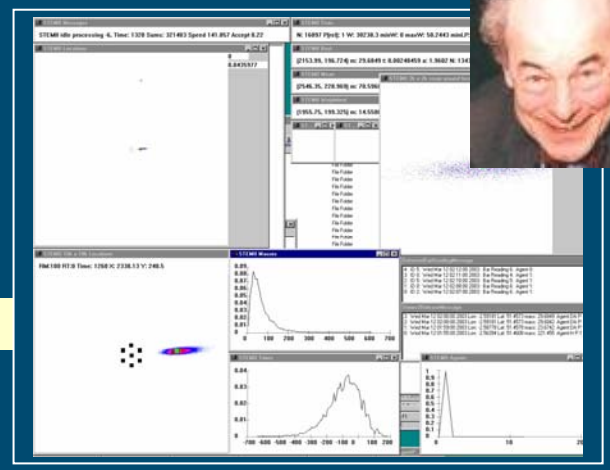
STE Demo Explanation

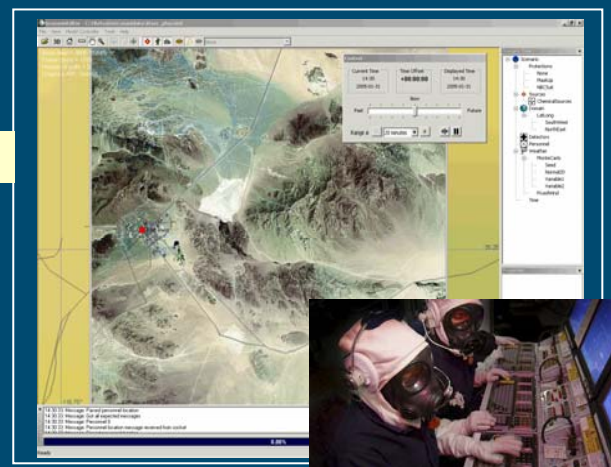


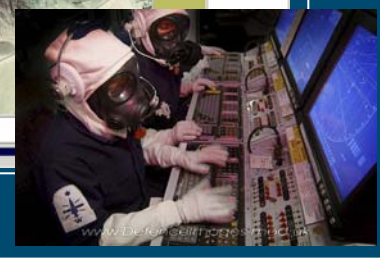
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

1. Release will be added to scenario

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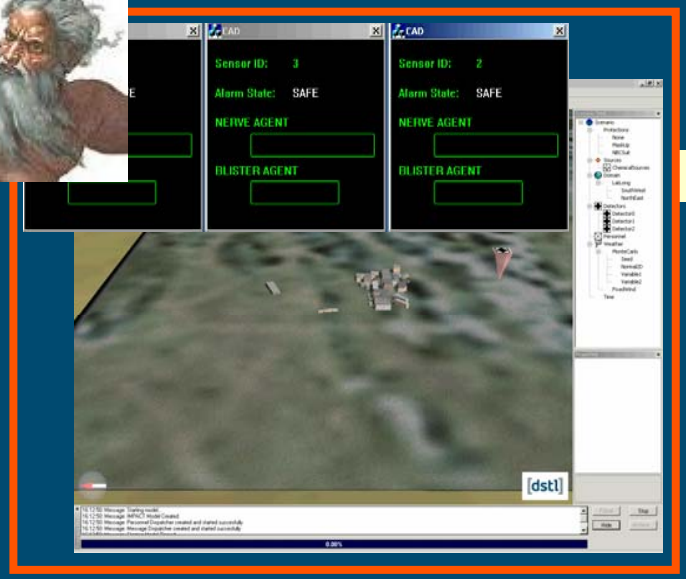
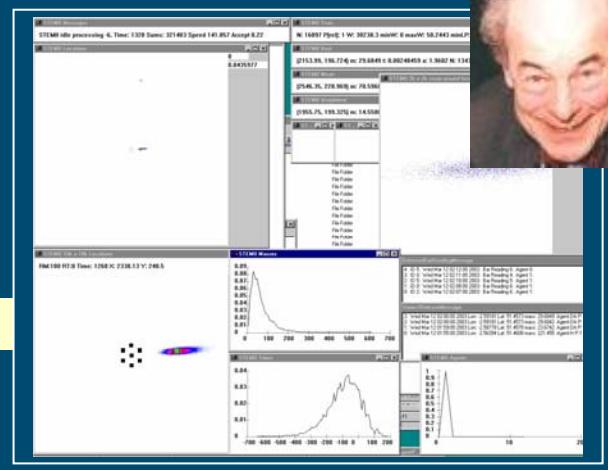
STE Demo Explanation

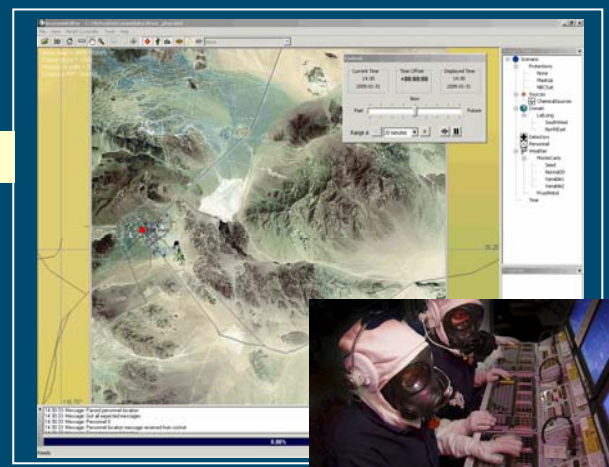


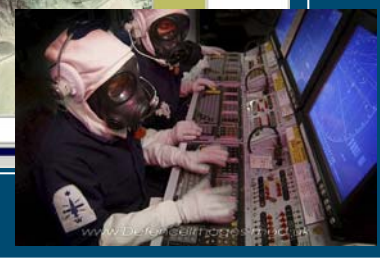
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

2. CBSim will model dispersion as a specific realisation

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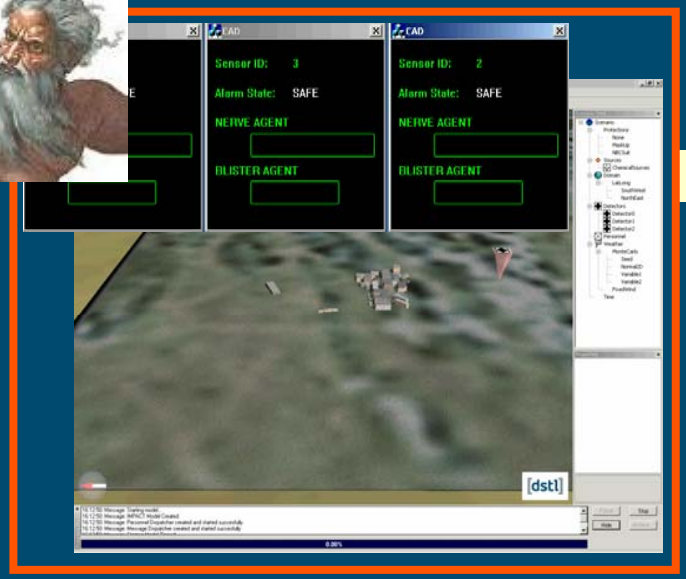
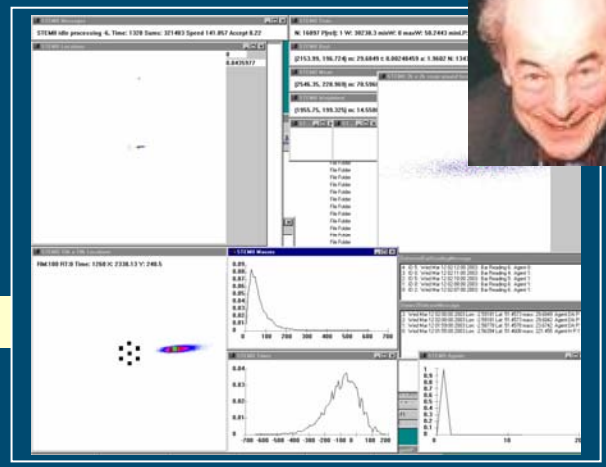
STE Demo Explanation

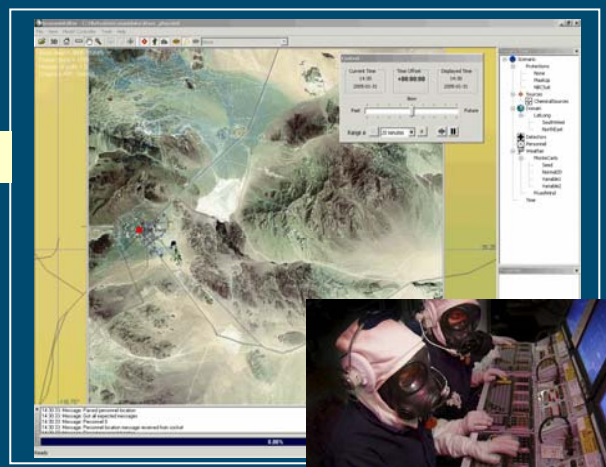


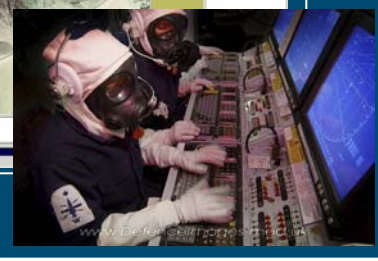
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

3. Cloud will hit detectors, which will alarm; an NBC message will be sent

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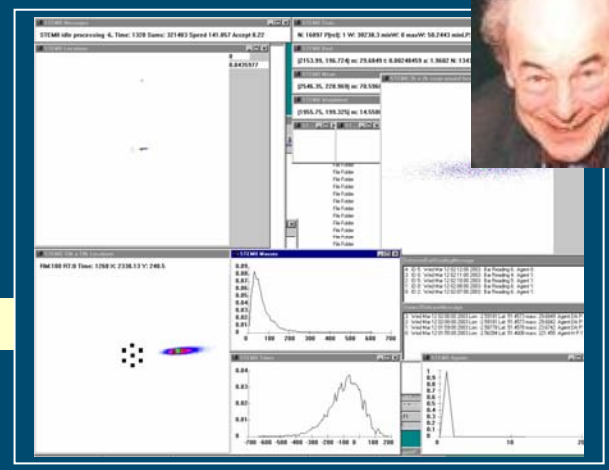
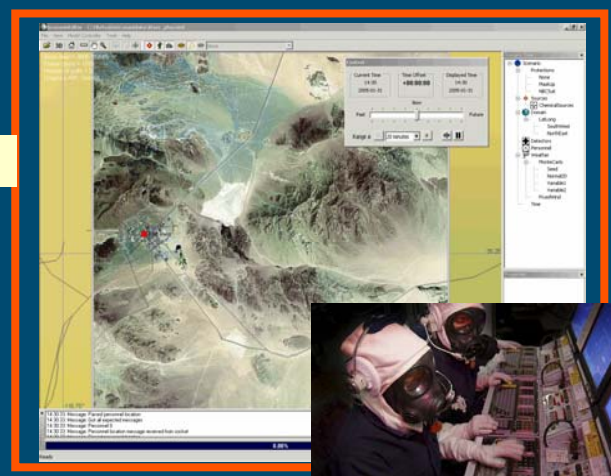
STE Demo Explanation

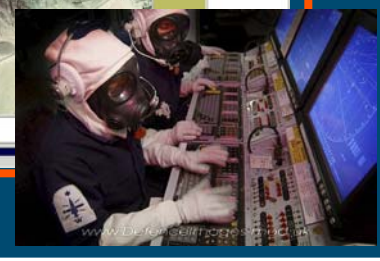
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

4. W&R system will display detector alarm

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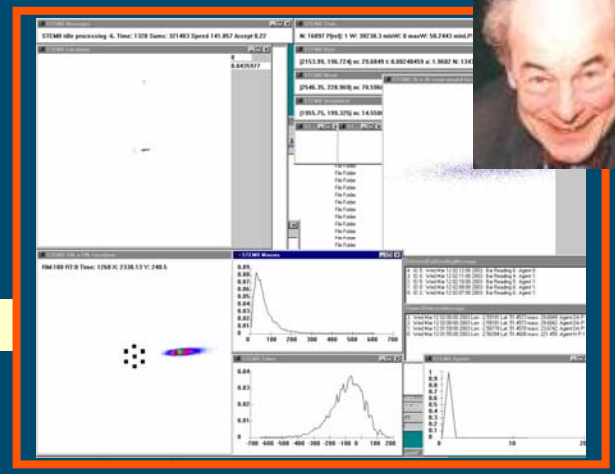
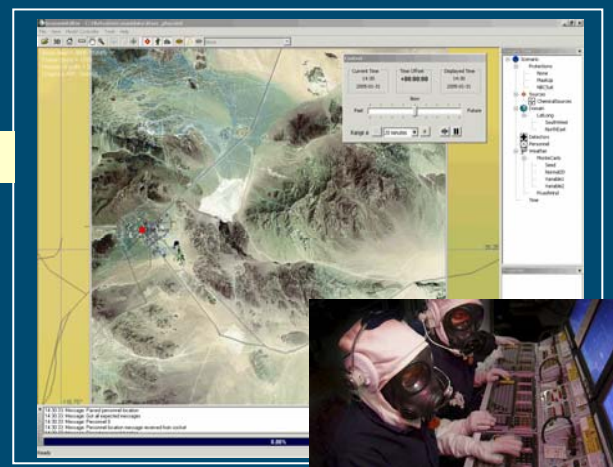
STE Demo Explanation

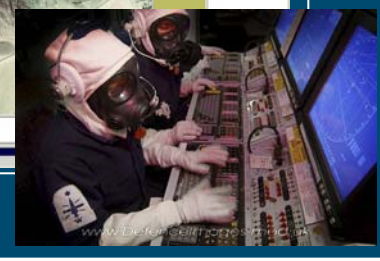
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

5. STEM II will fuse continuous output of detectors

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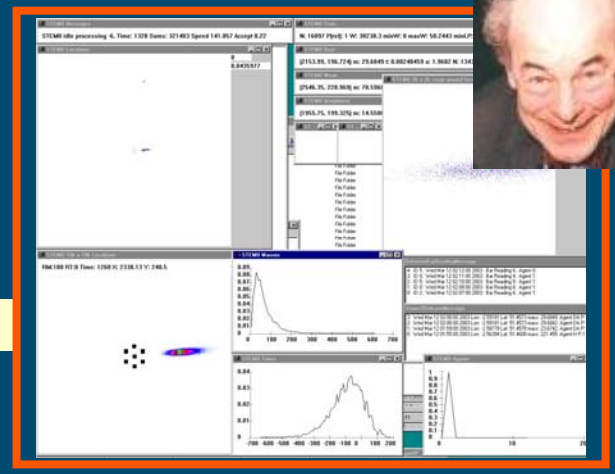
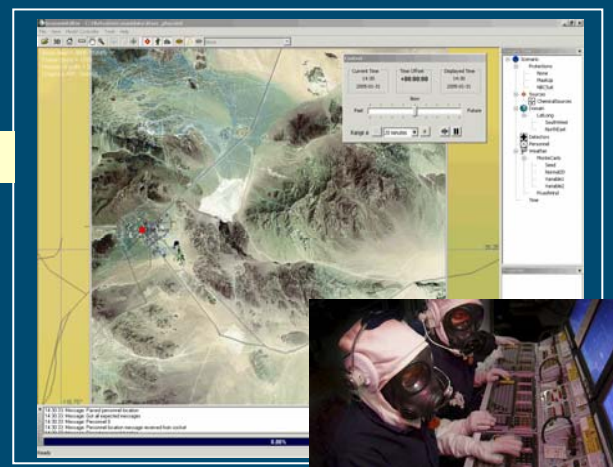
STE Demo Explanation

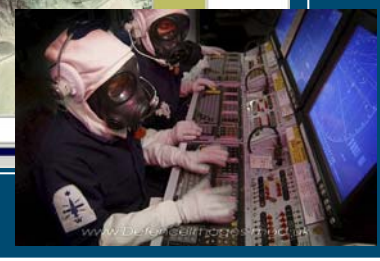
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

6. STEM II will transmit most likely source term as an NBC message

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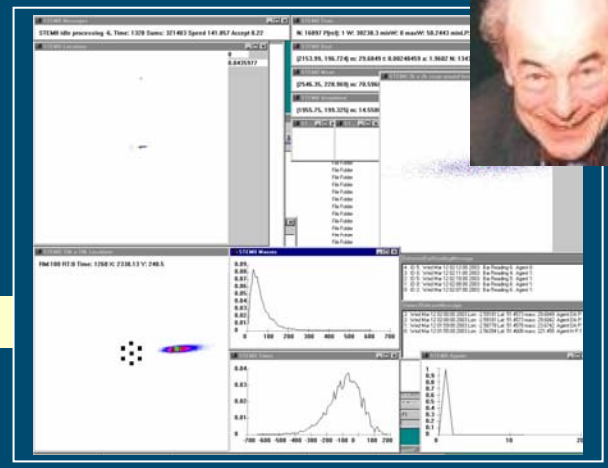
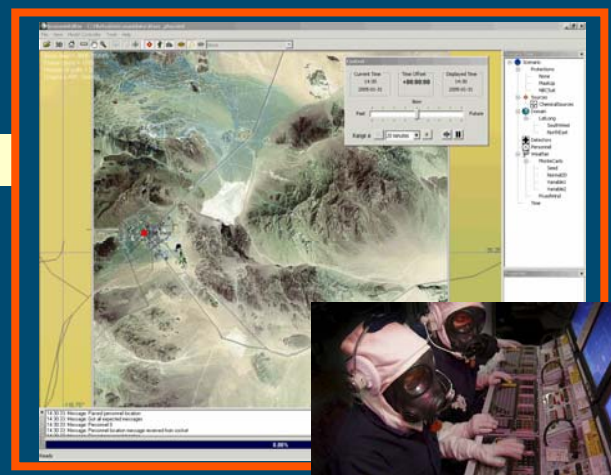
STE Demo Explanation

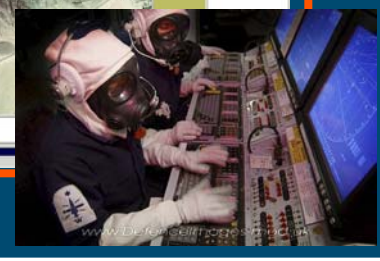
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

7. W&R system will display predicted source location and ATP45 triangle

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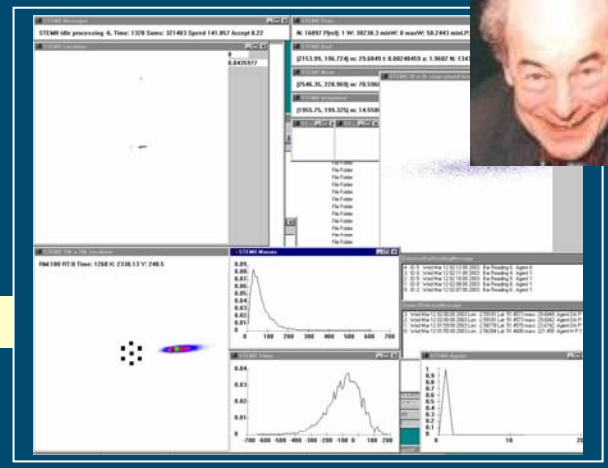
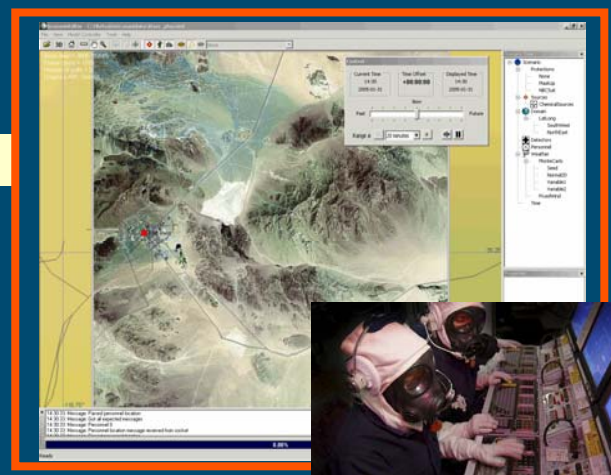
STE Demo Explanation

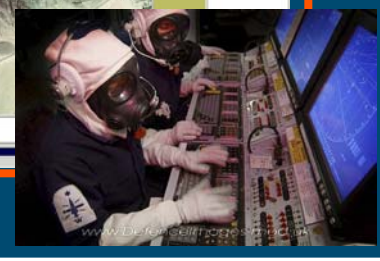
PC 1 - God's view

HLA RTI



PC 2 - Boffin's view





PC 3 - Operator's view

8. W&R system will model and allow display of predicted hazard plume

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