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Flexible Data Entry for Information Warning and Response Systems

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The Problem: Incidence Response

- The need to collect data that can provide warnings to avert crisis situations is paramount to many modern military and civil response systems.

- Flexibility in the collection and description of new or ongoing incidents is critical for accurate and timely analysis and response.

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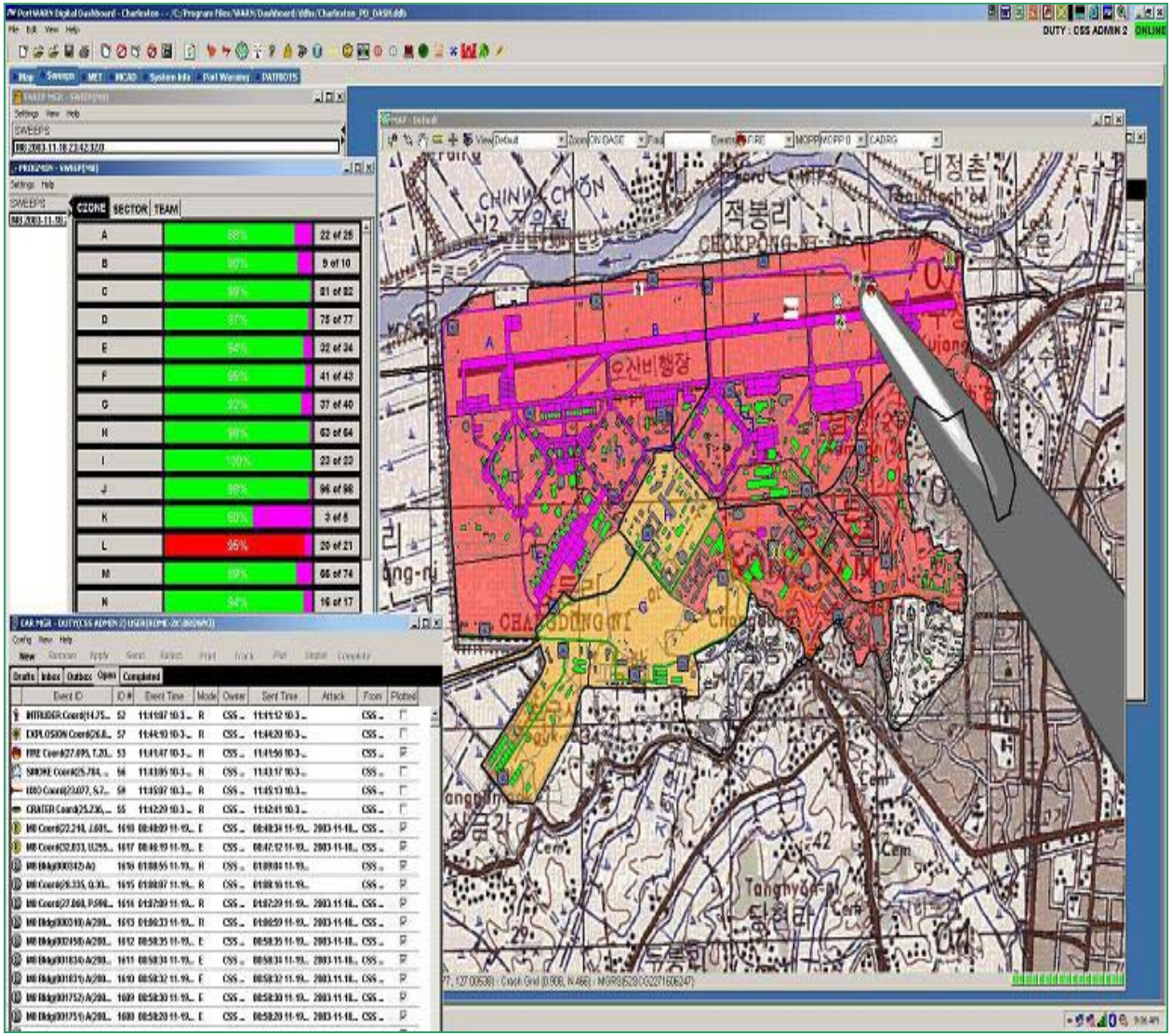
Integrated Information Management System - IIMS

- A Suite of Information Technologies:
  - Support the Command and Control (C2) required to detect, track, collect, and analyze a variety of incidents.
  - Provide the means for fusing information from a variety of data sources that are associated with the detection and tracking of chemical and biological attacks, both overt and covert.
- Detailed Capabilities:
  - Effective Nuclear-Biological-Chemical modeling.
  - Display and update of situation awareness.
  - Information fusion and analysis.
  - Incident detection and tracking.

IMMS System Components

- Digital Dashboard Command Post Software
  - A data fusion system providing a suite of applications designed to consolidate, display, and manage both day-to-day and Chemical-Biological contingencies and hazard data from sensors, reconnaissance reports, and hazard modeling.
- Detection Network
  - Is established by using electronic, signal-control devices that provide a communication link and a computer interface to integrate dissimilar, remotely located devices (e.g., detectors, sirens, warning lights, GPS receivers, and meteorological sensors) into a common network.
- Warning Devices
  - Consisting of both audio systems and light systems that disseminate alarms and critical condition information.

IMMS Digital Dashboard

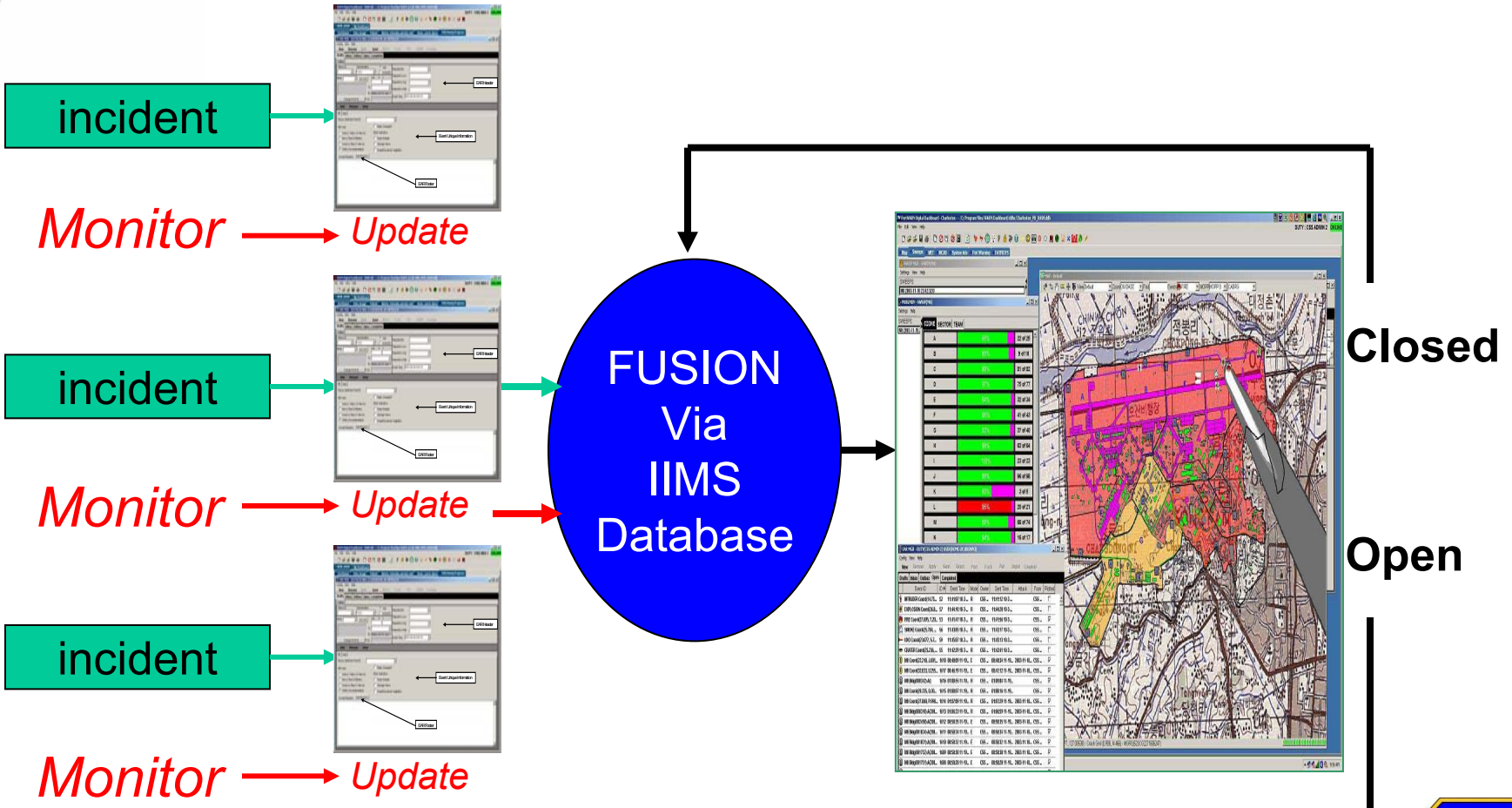


- The dashboard can be *configured to suit* the needs of a particular operator or for a particular situation.
- Incidents (along with associated analysis data) can be *displayed and tracked* through the dashboard.

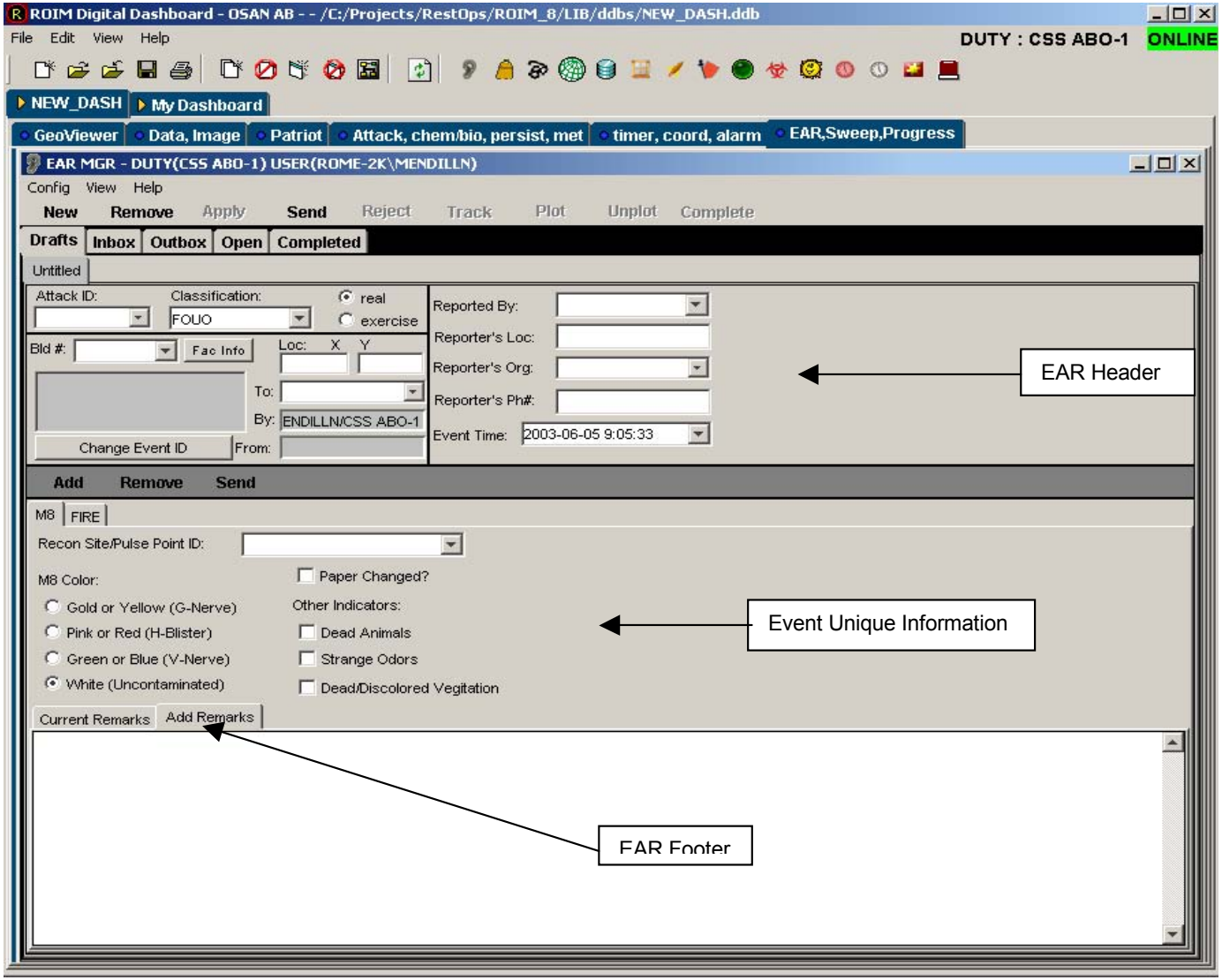
Incident Collection

- IMMS supports the ***collection*** of a variety of incidents through a tool called the Electronic Activity Report (EAR) Manager.
  - The EAR tool is available through the IIMS Digital Dashboard.
  - The EAR tool supports both standalone incident collection and collaborative collection and analysis.

Incident Collection and Analysis

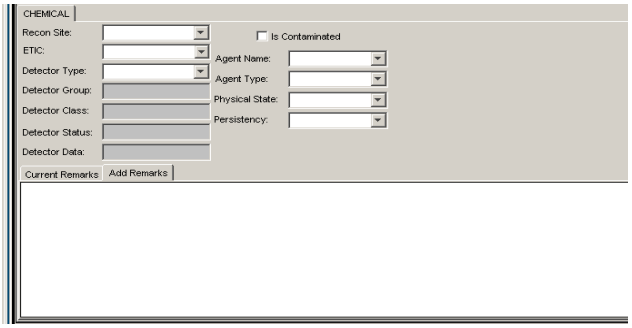


Electronic Activity Report (EAR)

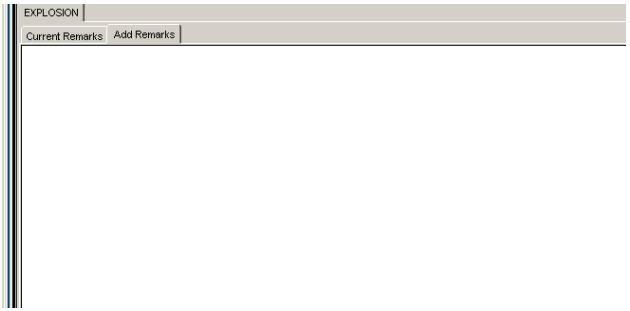


Electronic Activity Report Categories

- There are over 33 EAR categories currently defined and used in IIMS:
  - Some of these have detailed fixed data entry elements.



  - Some have only headers and footers for comment fields.
  - Any undefined data type must be described as text in the comment fields



Experiment Objectives

- *Situation:* Since all of the data description elements in the EAR forms cannot be realized in the design process, it would be useful to provide forms that can adapt to the data being collected.
- *Objectives:*
  - Allow the user to capture data about events that were not anticipated and therefore not defined in the existing data entry forms or database schema.
    - Allow EAR data fields to be extended by those users who are actually conducting the monitoring and collection.
    - Allow users to specify new data fields in a structured format instead of as a textual comment.
      - Convert EAR data element representation to XML.

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Expected Benefits

- Reduced use of incident descriptions as textual remarks
  - By allowing users to add incident descriptions as XML data elements more immediate automated data analysis and interchange with other XML based systems would be enabled.
- Facilitate database schema revisions to meet incident reporting requirements
- Enhance ability of IIMS to interchange data with XML-based systems/tools

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Our Approach

- Use a tool called *Tracker* to support the generation of incident templates.
- Use the Tracker tool to support the extension of the data-entry forms *during* incident reporting.
- To store Tracker-based incident reports into the IIMS Oracle Database.

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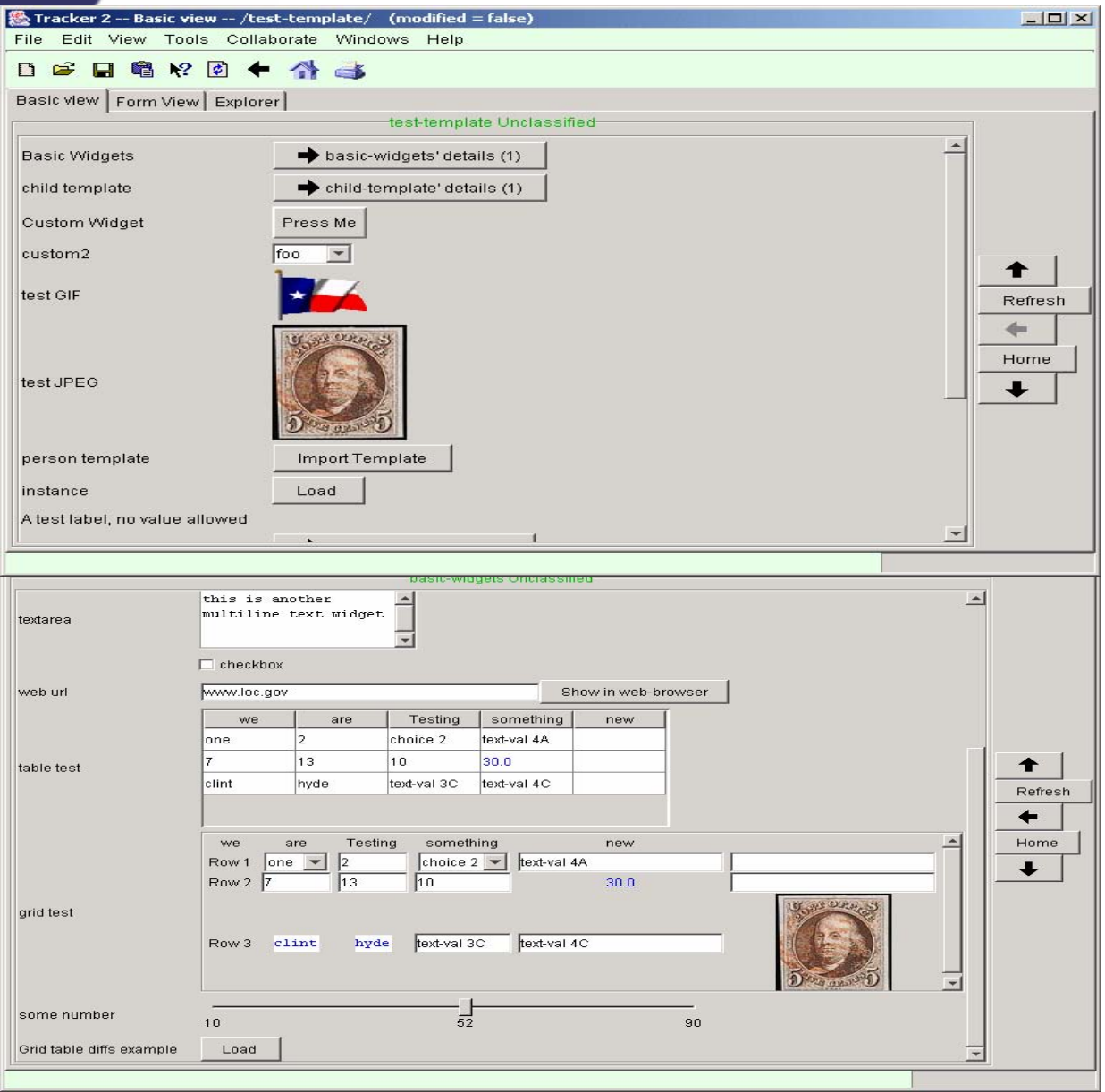
Tracker Overview

- Tracker was developed as part of the DARPA Active Templates program. It was developed to support both the construction and usage of templates at different levels of the C2 structure.
- It supports template authoring with:
  - A full set of Java/Swing widgets.
  - Custom widgets, loaded dynamically by a template.
  - Scriptable values, role-based field-locking, and pictures.
- It supports template usage and extension in both a standalone and in a collaborative mode.

Tracker User Documentation

- Complete documentation.
- On-line Help.

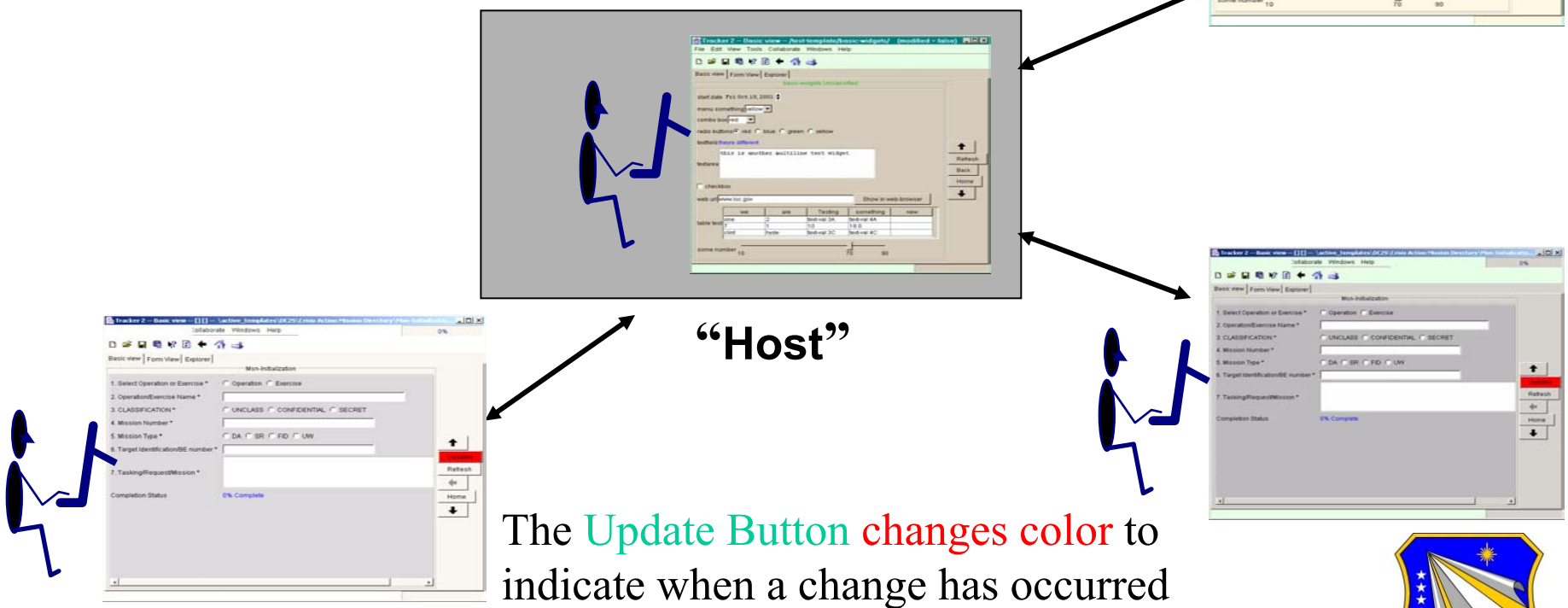
Tracker Authoring Tools



- Text field/area, checkboxes, radios, menu, list, images, table, grid, slider, date(s), URL, external-app-call (e.g., maps), sub-templates.
- Custom Java widgets (special output reports including: text and PowerPoint).
- Easy linking of pre-defined templates.
- Easy linking of field values with other values with or external to a template.
- Action buttons (script code).
- Script-computed value fields (for supporting computations).
- Attachments.
- Database interfaces.

Tracker Collaboration

- A set of *related* templates can be shared among users.
- All edits are dynamically sent to all others who have that template open.



The Update Button changes color to indicate when a change has occurred

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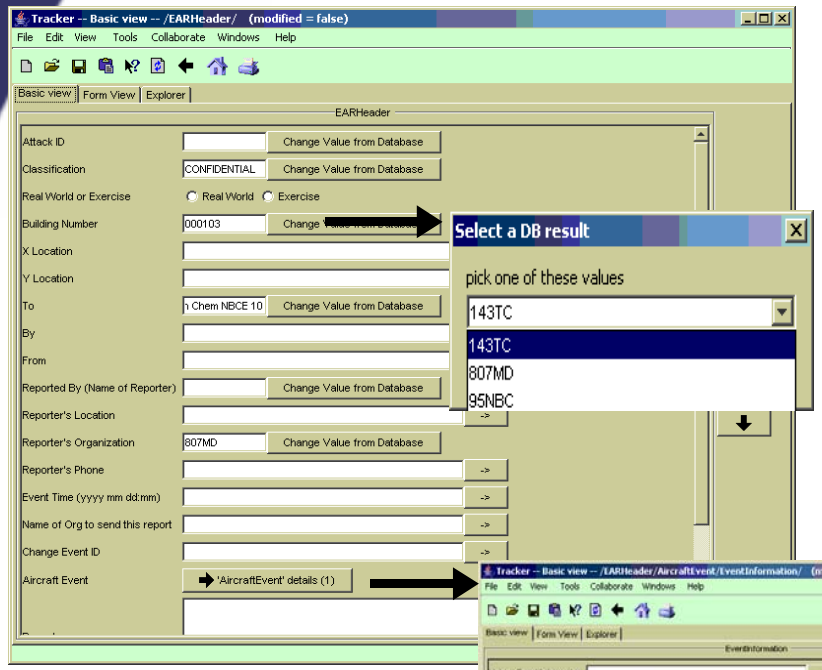
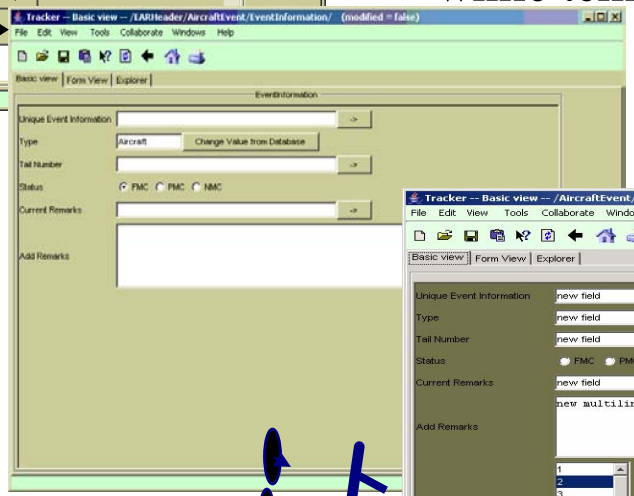
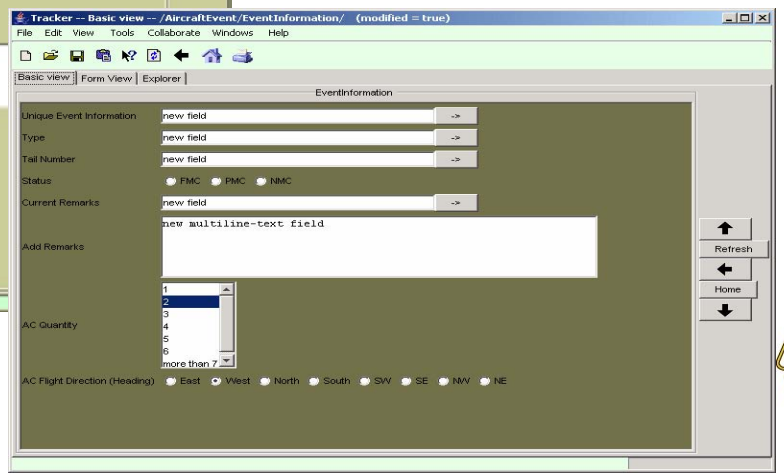
Tracker/IIMS Experiment Tasks

- Run Tracker as a *Dashboard Cell* and as a *standalone* application.
- Use Tracker to convert existing EARs into XML-based templates.
- Allow end users to modify an EAR during incident reporting through the use of a Tracker EAR template.
- Store Tracker-based incident reports into the IIMS Oracle Database.
- Provide information about added data elements to IIMS for possible incorporation into the IMMS database.

Tracker Version of the EAR







- We developed Tracker templates to represent many of the 33 EAR categories.
- We enabled data value pulls from IIMS database.
- Tracker templates partition parts of the EAR structure into separate templates that can be reused across templates as sub-templates.
- New data entry fields can be easily added while templates are being used to collect data.

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Results

- We were not able to implement Tracker as a cell within the IIMS Dashboard.
  - *Future option*: if the Tracker authoring widget tools were separated from Tracker, then the authoring capabilities could be more easily integrated and used by tools like IIMS.
- We were able to demonstrate that by using a standalone Tracker, EAR data fields can be easily extended by those doing the incident monitoring and collection.
- Tracker EARs are already represented as XML.
- A database table was developed to provide the IIMS administrator with information about newly added or modified Tracker-based EAR templates and/or data fields. This table in effect specifies requirements for future EAR (and associated database schema) revisions.

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Conclusion

- Flexibility in the collection of incident data and incident descriptions is critical for accurate and timely analysis and response by military and civil response systems.
- The importance of both the need for *data* and the need for *dynamic flexibility in data collection* is magnified *when the incident is ongoing*.
- Our research indicates that the provision of unstructured, flexible data entry systems like *Tracker* can offer the end user the ability to modify and update templates that have schema-specific structure.