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Safeguards Information Management Systems (SIMS)

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Safeguards Information Management Systems (SIMS)

1.0   ABSTRACT

The requirements for the management of information at the International Atomic Energy Agency (IAEA) and its Department of Safeguards are rapidly changing. Historically, the Department of Safeguards has had the requirement to process large volumes of conventional safeguards information. An information management system is currently in place that adequately handles the IAEA's conventional safeguards data needs. In the post-Iraq environment, however, there is a growing need to expand the IAEA information management capability to include unconventional forms of information. These data include environmental sampling results, photographs, video film, lists of machine tools, and open-source materials such as unclassified publications.

The U.S. Department of Energy (DOE) has responded to this information management need by implementing the Safeguards Information Management Systems (SIMS) initiative. SIMS was created by the DOE to anticipate and respond to IAEA information management needs through a multilaboratory initiative that will utilize an integrated approach to develop and deploy technology in a timely and cost-effective manner. The DOE will use the SIMS initiative to coordinate U.S. information management activities that support the IAEA Department of Safeguards.

2.0   INTRODUCTION

Historically, the Department of Safeguards has processed large volumes of conventional safeguards information derived from the Member States and the IAEA inspectors. An information management system is currently in place that adequately handles conventional safeguards information requirements. While at some point in the future this system will need modernizing, its basic capabilities meet the needs of conventional verification activities.

In the post-Iraq environment, however, the IAEA is experiencing a growing need to expand its information management capabilities to include more diverse types of information. These new information sources include environmental monitoring sample results (e.g., water and sediment), sample results from inside a facility (e.g., smear samples), photographs, maps, line drawings, video films, lists of equipment (e.g., machine tools and flow-forming equipment), and open-source materials (e.g., unclassified publications).

Non-traditional and open-source data are anticipated to play a significant role in the IAEA's effort to carry out its new and expanded responsibilities in international safeguards. The IAEA has recognized the need for enhanced information management capabilities and has initiated several internal initiatives and discussions with Member States. Both the Standing Advisory Group on Safeguards Implementation (SAGSI) and the Board of Governors have identified the need for the IAEA to implement enhanced and more sophisticated information management techniques. The objective is to improve the overall effectiveness of the IAEA and to strengthen international safeguards.

3.0   DOE INITIATIVE

The DOE has responded to this IAEA information management need by implementing the SIMS initiative. The DOE will use the SIMS initiative to coordinate U.S. information management activities that are in support of IAEA safeguards activities.

SIMS is a U.S. multilaboratory initiative that utilizes an integrated approach to develop and deploy technology in a timely and cost-effective manner. It is comprised of participants from the Lawrence Livermore National Laboratory (LLNL)[2], Los Alamos National Laboratory (LANL)[3], Pacific Northwest Laboratory (PNL)[4], and Sandia National Laboratories (SNL)[5]. The DOE provides the overall project management leadership, and the national laboratories provide the technical leadership for both hardware and software systems.

4.0   APPROACH

The SIMS initiative will anticipate and respond to IAEA information management needs. The intent is to target specific, high-priority needs. The initial tasks will be modest, very near-term needs for Fiscal Year (FY) 1994 and FY-1995. The initiative will identify long-term needs and develop a longer-range vision during FY-1994 for FY-1996 and beyond. Integrated

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[5]   Sandia National Laboratory is operated for the U.S. Department of Energy under Contract DE-AC04-94AL85000.

standards relative to system architecture, user interface, and data communications protocol will be developed.

A key ingredient in the process is to initiate and maintain a dialogue with the users, thereby establishing IAEA ownership in both the process and outcome. The products of the SIMS Initiative will be modular in nature allowing the IAEA to assimilate manageable-sized products and activities. The expectation is to evolve a family of systems over time that meet the high priority needs of the IAEA.

It is our intent that the SIMS initiative be viewed as a technical support activity to the IAEA. It is anticipated that the SIMS family of systems (Fig. 1) will be discrete and evolutionary in nature. These products must be user-friendly tools that are useable by IAEA inspectors and/or analysts. Throughout this process, the development activities will require close coordination with the IAEA to ensure that functionality is based on what the IAEA needs.

The initial activities build on the International Nuclear Safeguards Inspection Support Tool (INSIST) platform, but we anticipate that significant changes in hardware application and software architecture may occur in the process of identifying user needs. The INSIST platform, which is described in detail in another paper at this Symposium, has two unique features that meet existing needs at the IAEA: (1) the ability to geo-reference data and (2) the capability to handle multimedia information. INSIST is based on a Sun SPARC 10 workstation.

5.0   ORGANIZATION

The SIMS initiative is organized as shown in Fig. 2. Operationally, management of the initiative is provided by the DOE/Multilaboratory Steering Committee comprised of representatives from the four national laboratories and chaired by the DOE. Its purpose is to (1) provide the overall leadership for the various working groups; (2) set the schedules; (3) approve the architectural designs, establish project management criteria including configuration control; (4) interact with other U.S. Government agencies and initiatives (e.g., POTAS[6]) and the IAEA; and (5) help prioritize user requirements. The Steering Committee provides the broad perspective for the initiative and articulates the SIMS vision.

At present two Working Groups report to the Steering Committee, but another may be added in the near future. The two Working Groups are (1) User Requirements Group and (2) Technology and Systems Group. Each group is comprised of representatives from the national laboratories.

The User Requirements Group is an ad hoc Working Group that is responsible for interfacing with the IAEA community and determining its information management needs. The process used to develop the IAEA user needs will be interactive: the User Requirements Group will meet with the IAEA staff and management to obtain their perspectives regarding their needs, prepare a user requirements document following these discussions, and then review the document with the IAEA to obtain feedback. Once the User Requirements Group is satisfied that it has prepared a document that reflects the IAEA's perspective, the document will be presented to the SIMS Steering

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[6]   U.S. Program for Technical Assistance to IAEA Safeguards

Committee. This User Requirements document will evolve as needs are further identified and the project progresses (i.e., living document).

In summary, the User Requirements Group will define IAEA user needs in terms of IAEA needs, but it will not define the functional capabilities necessary to meet these needs.

The <u>Technology and Systems Group</u> is an ad hoc Working Group that is responsible for developing and defining the umbrella systems architecture, standards for compatibility, software configuration management, and integration requirements. This group provides the expertise for computer science, software engineering, and hardware compatibility to the SIMS initiative.

Once the User Requirements Group completes the User Requirements document, the Technology and Systems Group's responsibility will be to ensure the necessary technical overview of the products being developed under the SIMS initiative. One of the main issues will be to ensure that the proper · functionality has been defined.

A third ad hoc Working Group may be utilized in the near future. A <u>Safeguards Advisory Group</u> would be responsible for advising the Steering Committee on implementation issues. This group will be made up of subject matter experts who understand how a SIMS product will be implemented and the information utilized at the IAEA.

6.0   PRELIMINARY USER NEEDS FEEDBACK

The User Requirements Group held its first meetings with members of the IAEA staff and management during the week of January 10-14, 1994.   The Group learned a lot about existing databases for traditional safeguards accountancy

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and related purposes. Significant progress already has been made with respect to managing information on states' nuclear activities.

The preliminary results of these meetings in Vienna indicate several high priority, immediate needs:

- enhancements to the existing INSIST[7] workstation dedicated to the UNSC-687 Action Team

- support the field trials environmental monitoring data with a database for the Program "93+2" Initiative workstation

- notebook-based field portable systems such as the On-site Inspection System (OSIS), which was demonstrated throughout the week.

A follow-up meeting is planned for April/May, 1994, to review and revise the findings of the User Requirements Group visit to Vienna in January, 1994. An important purpose of this meeting will be to obtain IAEA ownership of these findings by the IAEA.

7.0   NEAR-TERM (FY-1994) Products

The User Requirements Group will identify and define IAEA user needs for enhanced safeguards information management capabilities aimed at strengthening safeguards. A User Requirements Document will be prepared, reviewed, and revised by the IAEA and presented to the Steering Committee.

The Technology and Systems Group will define the hardware, software, and databases to expand and enhance IAEA information management capabilities to meet the needs described in the User Requirements Document. This group will provide consistent interfaces for analysis, storage, retrieval, reporting, and browsing application systems. In addition, the systems architecture will be

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[7]   International Nuclear Safeguards Inspection Support Tool - INSIST

developed to afford ease of maintenance, extensibility, and modularity of function.

An IBM compatible **field portable unit** with a graphical user interface will be developed to visually select and manipulate site diagrams, equipment lists, site information, and inspection reports. The user will also be able to install and run independent applications (such as text retrieval and word processing), from a Windows environment. The field portable unit developed in FY-1994 will be considered a prototype because it will not be completed for the units intended uses as an on-site inspection tool until the following fiscal year. Additional capabilities will be developed during the following year, utilizing the expertise gained through the early deployment and use of the unit by the IAEA.

An **INSIST Program "93+2" Initiative workstation** will be enhanced to handle environmental monitoring data from the IAEA Field Trials in Sweden and Hungary. This new capability will be implemented using a geographic information system (GIS). The GIS capability will provide for the ability to query a sample database and display results on a map background.

The **INSIST UNSC-687 Action Team workstation** will be enhanced to (1) search and retrieve text and graphics, (2) analyze data, (3) access their network for information, and (4) download selected information to portable computer systems. Additional database capabilities that are developed by the IAEA Action Team will be implemented in the INSIST workstation as appropriate.

In addition, TOPIC, which is a full-text search and retrieval software, will be integrated with the current INSIST code for rapid deployment to the IAEA.

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Finally, an existing geographic reference capability (Gazetteer) developed at LLNL will be deployed. The Gazetteer is an index of names and coordinates that is accessed to implement text-to-location and location-to-text searches.

In conclusion, the demands on the international safeguards world is changing, and the information management systems must adapt to new sources and types of information. In response to these changes, the DOE has created the SIMS initiative that is intended to anticipate and respond to the future IAEA information management needs. This DOE multi-laboratory initiative will target specific, high-priority IAEA information management needs. The SIMS Initiative, while in its infancy, has the potential for developing and deploying significant information management systems for the IAEA.

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