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Initial Operation of the Savannah River Site Advanced Storage Monitoring Facility

by

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INITIAL OPERATION OF THE SAVANNAH RIVER SITE ADVANCED STORAGE MONITORING FACILITY

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ABSTRACT

An advanced storage monitoring facility has been constructed at the Savannah River Site capable of storing sensitive nuclear materials (SNM) with access to monitoring information available over the Internet. The facility is presently storing a significant quantity of HEU and is monitored with passive infrared devices, volumetric video surveillance, door alarms and T-1 electronic sensor platforms. The system is controlled and data is collected, stored and disseminated by a set of computers using the Sandia National Laboratories Material Monitoring System (MMS). The system was developed as part of a joint SRS/SNL/VNIIEF program to demonstrate advanced monitoring technologies in the Russian Federation and United States. A comparable facility is in operation in Sarov, Russia that will also store SNM but will use Russian designed and fabricated equipment for the monitoring regime. This system will also have monitoring information available over the Internet to appropriate users. The programs will ultimately supply authenticated and encrypted data from the storage sites to certified users to demonstrate the capability of using the Internet as a safe and secure communications medium for remote monitoring of sensitive items.

INTRODUCTION

Work has been ongoing for several years to develop monitoring technologies that might be used in future arms control regimes. This work has involved Sandia National Laboratories (SNL), the Savannah River Site (SRS) and the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF). The work presented in this paper is referred to as the "Facility to Facility" program (F2F) and is the third of three stages. The "Container to Container" experiment was completed in 1997; this demonstration included a container at Sandia National Laboratories and a container at VNIIEF which were monitored with several devices. Information collected from the monitoring devices was available to the U.S. and Russian laboratories and to the public via the Internet. The Container to Container experiment demonstrated communications capability and several remote monitoring techniques. The next stage was the operation of monitoring systems in rooms in Sandia National Laboratories at Livermore, California and at Sarov, Russia. The second stage was on line in 1998 and was called "Magazine to Magazine," signifying the monitoring of simulated nuclear material storage magazines (no nuclear material present) in both countries. This experiment demonstrated the capability of remote monitoring over long periods of time and the ability of sharing data over the Internet. Similar monitoring devices were developed by both the U.S. and Russian sides to determine if unauthorized access had occurred to either the room or the storage containers. Pictures illustrating each of the three stages are shown in Figure 1 below.

This paper describes the current stage, the "Facility to Facility" demonstration, which is currently operational. Also included in this paper is a description of the U.S. facility, including the

monitoring and computer systems, a description of the "Opening Ceremony" and the status and plans for this experiment.

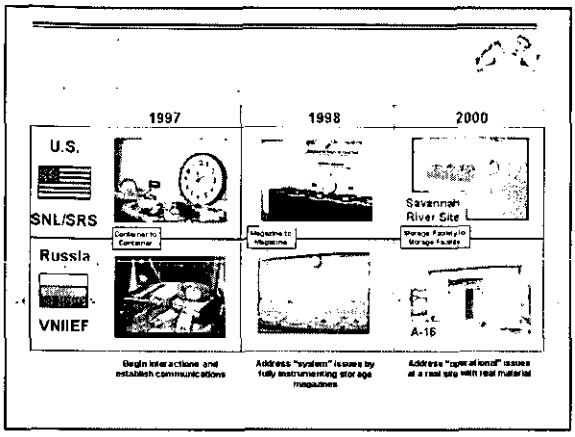

Figure 1. Three Stages of U.S. and Russian Cooperation

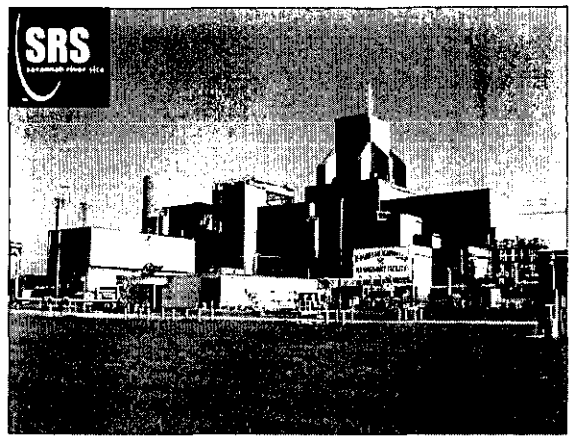

Figure 2. K-Reactor - Location of SRS Facility

SRS STORAGE FACILITY

The storage facility at SRS contains highly enriched uranium, stored in palletized shipping containers, four shipping containers to a pallet. Each pallet of containers is protected by a T-1 radio frequency tamper indicating device, developed at Sandia National Laboratories. Also installed in the storage facility is an Echelon network. Two passive infrared motion detectors, a DCM-14 camera and a balanced magnetic switch are attached to the Echelon network. The DCM-14 camera can be triggered by any of the Echelon sensors. A video monitoring system, which uses NTvision software developed at Los Alamos National Laboratory, is also installed in the facility. Two analog CCD cameras sample the storage facility while the NTvision software records events when the most recent sampled image is sufficiently different from a predefined reference sample image.

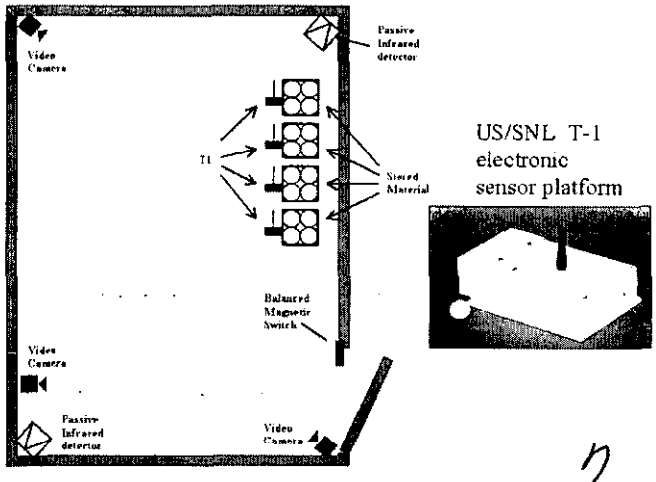

Figure 3. SRS Storage Facility Layout

Sensor and computer interconnection details are shown in Figure 4 below. Data from the Echelon sensors are routed to the Material Monitoring System (MMS) Data Collection Computer, located in the facility computer room. Images from the NTvision cameras are transmitted to the NTvision computer which is also located in the computer room. Sensor information and image data are transmitted to the MMS Data Storage Computer. Each of these computers are connected to the SRS intranet, which is used for communication between the local computers as well as for transmission of data through the SRS firewall and over the internet to a web site host computer at Sandia National Laboratories. The Sandia National Laboratories web site is accessible to authorized users from locations around the world via the Internet.

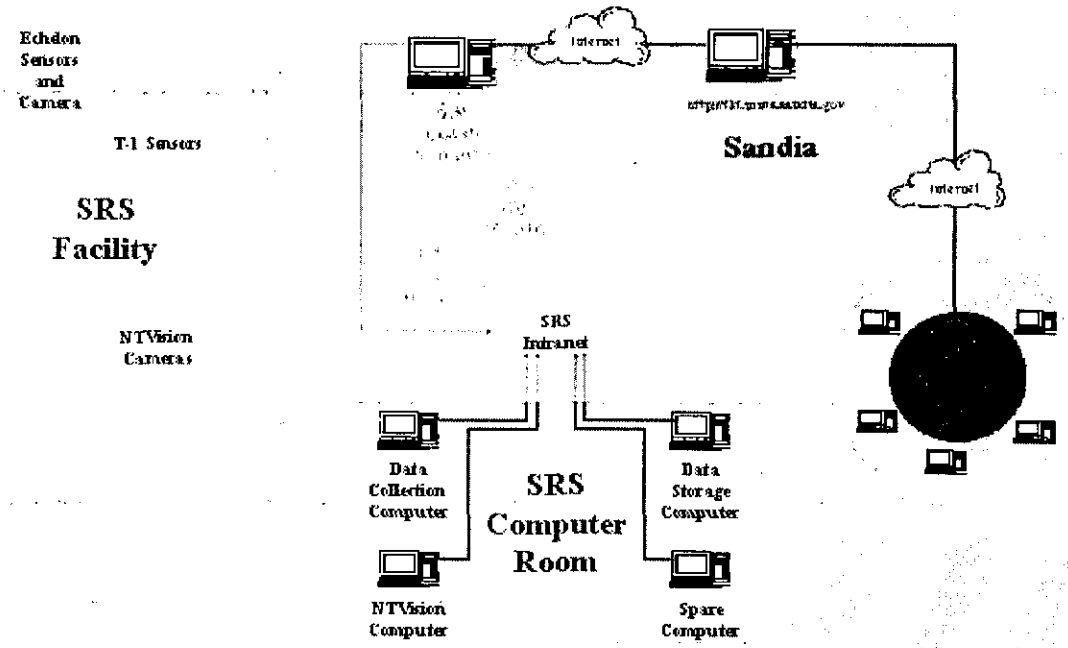

Figure 4. SRS Computer Layout

A variety of data are available from the MMS web site (Figure 5). A Real Time display provides data updated in real time from the various sensors. The Status display, which is the default display, provides the most recent sensor information. A Devices display lists all of the devices in use. The Calendar is a user-friendly display from which a viewer can select events for retrieval. There are

also Event Count, Events and Images selections which allow the user to tailor the information display according to his or her preferences. The software is designed to provide the user instant access to the data desired.

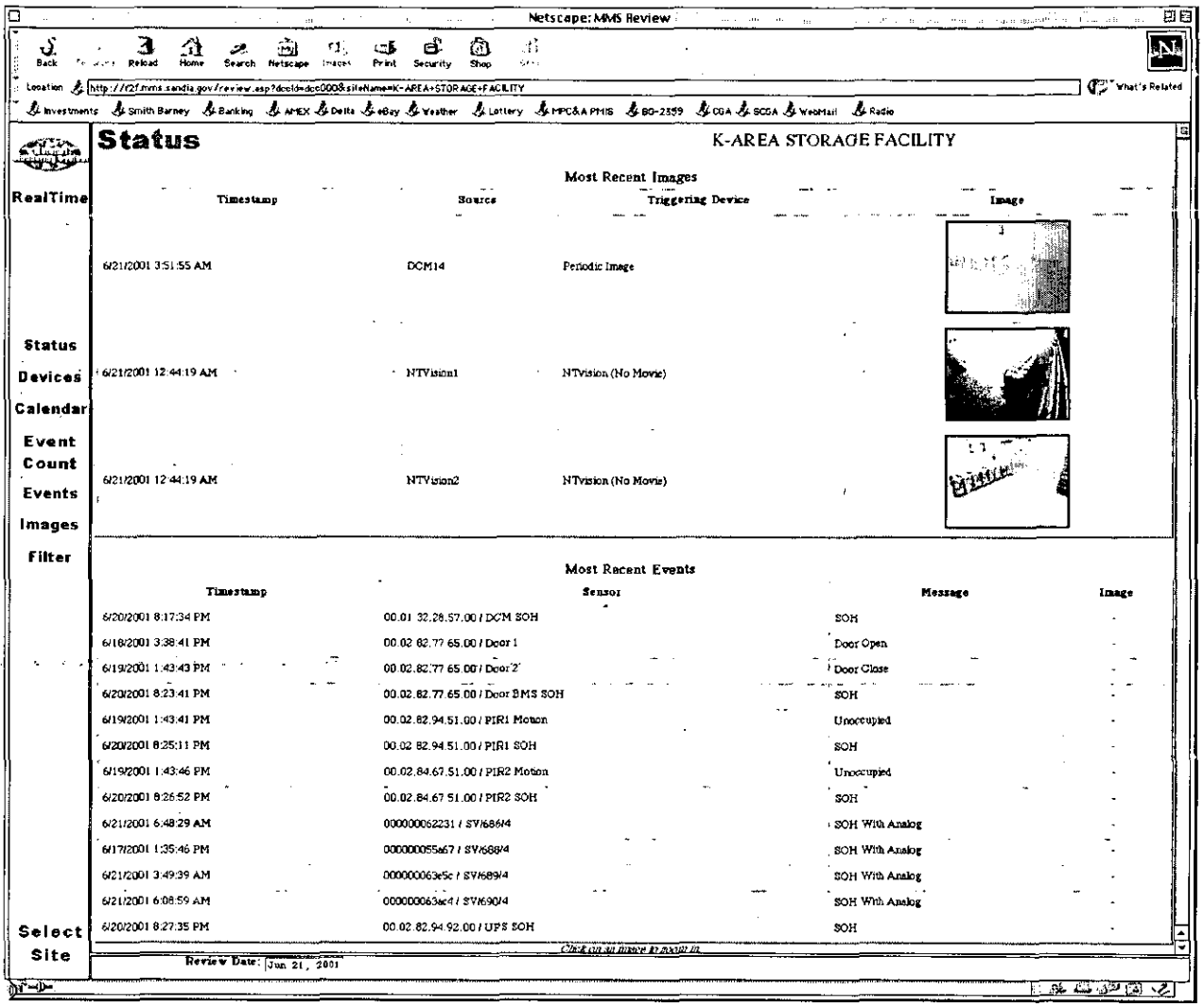

Figure 5. Material Monitoring System Web Page

OPENING CEREMONY

An opening ceremony was held at 10:00 am EDT on June 14, 2001. Simultaneous video transmissions from the U.S. and Russia were broadcast on the web site http://f2fceremony.sandia.gov (Figure 6). That web site is still available for viewing by interested parties. During the ceremony, opening remarks were made by officials at VNIIEF and SRS. Ribbons at each site were then cut simultaneously (Figure 7). The text of the opening remarks in Russian and English can be found at the above web site. Also included in the web site is a schedule for the ceremony.

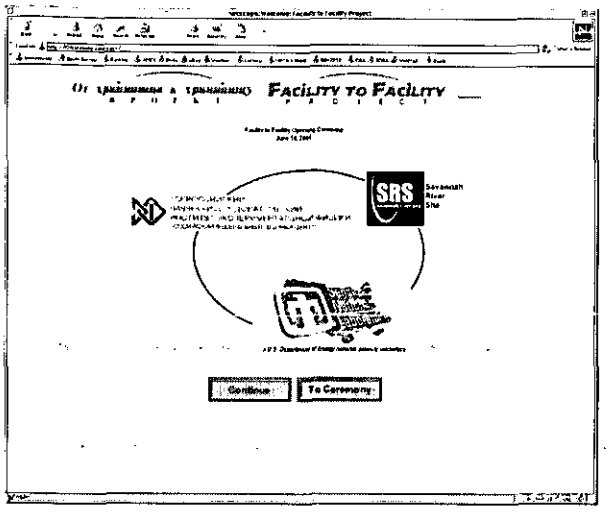

Figure 6. Internet Ceremony Web Site

Figure 7. Ribbon Cutting at VNIIEF and SRS

STATUS AND PLANS

The web site for the SRS facility is currently operational. In addition to providing information to U.S. and Russian parties, it is being used by facility operations personnel to perform domestic safeguards functions. The Daily Administrative Check, which formerly required two persons to enter the facility, is now accomplished by checking the web page for unexplained alarms. In the near future, the presence of the real time monitoring systems will provide the basis for an extension of the time between physical inventories.

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[2] Boris Barkanov and Thomas R. Lockner, "Initial Operation of the Sarov Storage Monitoring Experiment," presented at the 2001 INMM Annual Meeting.