MAPPING NUCLEAR VERIFICATION
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OVERVIEW

1. Tools and Utilities
2. Tour of Nu
3. Map Applications
   (4. Virtual Reality Exercise)
NU MAPPING UTILITIES

CONSTRUCTING COMPREHENSIVE VERIFICATION APPROACHES

1. TECHNOLOGY ORIENTATION AND LOCALIZATION

View the broader context of a verification technology and possible overlap with existing treaties

2. IDENTIFYING AND CLOSING GAPS

View the map in terms of verified and unverified transfer pathways

for example, between facilities within a given sector, between sectors, or to the “hinterland”

3. CONTEXT FOR VIRTUAL REALITY INSPECTIONS

Within a given Nu strategy, utilize VR for more detailed facility level inspection design & simulation
MAPPING NUCLEAR VERIFICATION

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WEBSITE TOUR

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Mapping Nuclear Verification

Laying the Basis for Nuclear Disarmament and Nonproliferation
Discover the Nuclear Verification Landscape
Explore Nuclear Verification Technologies

Verification technology development is an area rich in innovation and centers on answering questions such as: How can we determine whether a country is telling the truth about the total size of its nuclear arsenal? How can we determine whether a nuclear weapon presented to us is real, without learning any classified information about it? And, how can we ensure that a country is not secretly assembling new weapons under a treaty? We have made strides toward answers, but more work is needed.
Identification

EDDY CURRENT METHODS
Verification methods involving eddy currents have the potential to support the goal of achieving just enough information to uniquely identify items without providing unnecessary information.

MODAL TESTING
Modal vibration signatures might be used to uniquely identify warheads and containers.

Remote and Perimeter Monitoring
Magtag

MAGTAG blankets containing randomly oriented magnets are used to cover storage containers. A highly sensitive magnetometer detects any changes in the magnetic field due to illicit movements.

OVERVIEW

In the late 1990s, Los Alamos National Laboratory developed and demonstrated a number of systems that provided continuous, live sensor data to inspectors outside the facility in order to eliminate the need for information barriers and encryption.

The Magazine Transparency System (MTS) is one of these systems. It is designed to monitor treaty-limited items during either short-term long-term storage and detects unauthorized movement of weapon containers from the facility. Only passive tags and tags on the surface of the container need to be monitored for safety and security.
MAPPING NUCLEAR VERIFICATION CHALLENGES

- Ensuring the peaceful application of fissile material production
- Verifying numerical limits on declared nuclear warheads
- Establishing confidence in the absence of undeclared stocks or production
- Confirming the authenticity of nuclear warheads

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VERIFYING NUMERICAL LIMITS ON DECLARED NUCLEAR WARHEADS
CONFIRMING NUCLEAR WARHEADS
1. HASHED DECLARATIONS
Privacy-preserving declarations based on cryptographic hash functions, which would only reveal certain information for a particular site (if an inspection is called for that site)

2. PORTAL MONITOR
Portal-perimeter system to detect the passage of nuclear materials, for example, using standard neutron detectors
EXAMPLE | WARHEAD LIMIT AGREEMENT

Hashed Declarations
Confirming declared number of warheads

Portal System
Facility-level perimeter monitoring

Inspector Escort
Material sent to conversion or disposition facility

New START
EXAMPLE | WARHEAD LIMIT AGREEMENT

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MAPPING NUCLEAR VERIFICATION EXERCISES IN VIRTUAL REALITY

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Display area with a tabletop model of the site; in the background, shelves with buddy tags, one of them disturbed.
Storage bunker with warhead storage containers; inspectors can select one or more containers for inspection with information barrier.
Closeup of detector and information barrier with simulated radiation spectrum and shielding material handled by user
Virtual reality inspections of a warhead storage site | April 2017 | WWS 353 Science and Global Security
GROWTH OF NU WEBSITE
Working to expand library of technologies to support collaboration between complementary verification technology development efforts & increase interactivity of mapping tools.

CONSTRUCTION OF VR ENVIRONMENTS
Expanding set of virtual facilities comprising the Nu landscape; developing capabilities to run and evaluate inspection simulations in support of government-to-government and research community collaboration.

INTEGRATION OF NU AND VR
Further integration of Nu and VR to develop verification option sets from both a broad, birds-eye view and a detailed facility-level view.