Working Group 3 - Deliverable Nine

Summary

The development of a chain of custody paper, presentation or demonstration involving unique identification and tamper-indicating devices in a specific environment, such as a mock warhead storage area.

Working Group 3: Technical Challenges and Solutions

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Among the technologies identified by Working Group 3, a special category of methods defined as chain of custody (CoC) were considered. During Phase I of the IPNDV, only CoC measures for the dismantlement stages (steps 6–10) of the IPNDV Basic Dismantlement Scenario were discussed.

In this context, by the term *CoC*, the Working Group referred to technologies that can be used to establish and maintain the integrity and/or identification of objects for as long as stipulated. As for the objects themselves, they can either be the treaty accountable items to be dismantled, or the relevant facilities (such as storage areas) with the associated infrastructure. Thus, the Working Group considered CoC to be applicable to both the treaty accountable items and the facilities where these items are handled.

Several different technologies potentially suitable for CoC were discussed in the Working Group. In particular, several presentations of such technologies were given, first during a February 2016 Working Group meeting in Geneva, Switzerland, and then later in May 2016 during a Working Group meeting hosted by the European Commission's Joint Research Centre (JRC) in Ispra, Italy.

- Geneva: Two presentations, on an Unattended Monitoring Systems that detects movement by radiation detection, and on a container identification system by radio frequency, were given. A Change Detection System was also presented.

- Ispra: Several CoC technologies, including seals—electronic, ultrasonic, and copper brass seals—as well as 3D technologies for facility verification and change detection, identification and containment of containers, and surveillance of an area (instead of, or complementing, e.g., video surveillance) were presented to the Working Group.

These presentations and subsequent in-depth discussions on CoC technologies, resulted in Working Group 3's Chain of Custody Technologies Mapping Table with references to more detailed technology papers on each potential technology (Working Group 3 Technology Data Sheets CoC1 through CoC10).

The CoC technologies were divided into three categories: Surveillance, Containment, and Identification, where each category contains the following technologies:

- Surveillance: Personnel inspection, video, 3D, portal monitor, accelerometers, scales, and radiation detection;

- Containment: Tamper indicating devices/seals, 3D laser change detection, optical change detection, accelerometers, tamper indicating enclosures, and container integrity assessment; and

- Identification: Radiation hardened radiofrequency identification, 3D container identification, and tagging with a unique identifier.

For each technology, the applicability to each of the steps 6–10 in the Basic Dismantlement Scenario were considered, and Working Group 3 concluded that many of the technologies and methods identified are potentially applicable in the monitoring scenario. In this regard, the value of CoC measures in the actual dismantlement step, where they have the potential to at least partially maintain the integrity of objects, should be emphasized. This is otherwise a step where the inspecting party in all likelihood will have very restricted to non-existent access. During the actual dismantlement, surveillance technologies such as 3D cameras in a curtain configuration and portal monitors can monitor access control and movement to and from the facility. Containment technologies can be applied to facility equipment that should not be used (tamper indicating devices), for facility verification before and after the dismantlement (3D and optical change detection) and tamper indicating enclosures and container integrity assessment to confirm the integrity of equipment. However, for identification technologies, there is presently no method to maintain the identity of the treaty accountable item during the dismantlement step. This is due to the fact that the containerized nuclear weapon will be taken out of the container for dismantlement, and afterward the components will be containerized in more than one container.

International Partnership for Nuclear Disarmament Verification

The International Partnership for Nuclear Disarmament Verification (IPNDV), is an ongoing initiative that includes more than 25 countries with and without nuclear weapons. Together, the Partners are identifying challenges associated with nuclear disarmament verification, and developing potential procedures and technologies to address those challenges. Learn more at www.ipndv.org.

About Working Group 3: Technical Challenges and Solutions

Throughout Phase I, the IPNDV Technical Challenges and Solutions Working Group has investigated effective technologies, methods, and procedures that can be used for the specific technical challenges in the dismantlement process, such as identifying a nuclear device, maintaining chain of custody, and protecting proliferation sensitive material. This group is co-chaired by Sweden and the United States.