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Developing the Transportation –Security, Tracking and Reporting System (T-STAR) System

The Transportation –Security, Tracking and Reporting System (T-STAR) was developed by NNSA NA-21 Office of Radiological Security (ORS) to provide a transportation security system for use during transport of Category 1 and Category 2 radiological material to provide detection and tracking capability for shipments. While many off the shelf systems provide asset tracking of the conveyance, few offer detection of a breach into the cargo compartment or the removal of cargo from the conveyance. Systems that do offer such capability need to be permanently installed on the conveyance, requiring drilling of holes and running of cables throughout the conveyance itself. This means that dedicated shipping containers or vehicles are required, and this is not sustainable in many countries where ORS is building capacity for the security of radioactive materials in use, storage, and in transport. T-STAR is leveraging various ORNL technologies for improved communications capability and reduced power requirements; the multimode communications module developed by the Unmanned Aerial Systems group and the low power and extensible Authenticatable Container Tracking System (ACTS) tag developed for the US Department of Energy's Packaging Certification Program provide a small footprint tracking system which can be installed quickly as needed. T-STAR uses a cellular and an Iridium modem to communicate configuration and alert information to a server used to monitor the shipment and incorporates a Z-wave © wireless security system allowing various intrusion detection sensors to be located in the conveyance. The Z-wave sensors are readily available, inexpensive, and power efficient, making them replaceable and low maintenance. The server software be configured as a standalone system installed on a light duty computer hosted by the competent authority, carrier, or response agency, or hosted as part of an Amazon Cloud Server (AWS) accessible via a secure login. The server has two functions, first is to handle messages to/from the T-STAR field unit, second is to host the user interface which can be accessed using a web browser on desktop or mobile device. The user interface implements roles to determine the level of access to shipment information, define geo-fences, and configure notifications. The user interface also supports multiple languages for display as well as notifications by using a simple lookup file which can be modified by the host country to ensure translations are correct and meaningful to responders receiving notifications and alerts. This paper will detail the overarching T-STAR capabilities, architecture and components, and provide insights on how it is deployed, used, and monitored during transportation of radioactive material.

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